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1981 Model Year Carbon Monoxide Emission Standard for Light-Duty Motor Vehicles; Decision on Applications for Waiver of Effective Date and Adoption of Revised Standard

ENVIRONMENTAL PROTECTION AGENCY

[FRL 1397-7]

Applications for Waiver of Effective Date of the 1981 Model Year Carbon Monoxide Emission Standard for Light-Duty Motor Vehicles—Third Consolidated Decision of the Administrator

I. Introduction

This is the third consolidated decision I have issued under Section 202(b)(5) of the Clean Air Act, as amended (Act), 42 U.S.C. 7521(b)(5), regarding applications from automobile manufacturers for waiver of the 3.4 grams per vehicle mile (gpm) carbon monoxide (CO) emission standard scheduled to apply to 1981 and 1982 model year light-duty motor vehicles and engines.[1]

As both introductions to the previous consolidated decisions explain, section 202(b)(1)(A) of the amended Act establishes a schedule for implementing standards applicable to CO emissions for 1977 and later year light-duty motor vehicles and engines.[2] The 1977 amendments to the Act, However, included a new provision allowing the Administrator of the Environmental Protection Agency (EPA), under certain limited conditions, to delay for up to two model years implementation of the statutory 3.4 gpm CO standard scheduled to take effect for the 1981 model year.[3] These amendments require the Administrator to promulgate standards which do not permit CO emissions over 7.0 gpm for vehicles granted waiver applications.

Prior to the enactment of the 1977 amendments to the Act, EPA's Administrator had considered and granted requests from manufacturers for delays in implementing the statutory CO standards as provided by the earlier versions of the Act.[4] In those instances, the statute provided for consideration of waivers on a manufacturer-by-manufacturer basis, and the Administrator granted waivers covering the whole industry. The Act's current section 202(b)(5) requires the Administrator to reach a separate waiver decision for each vehicle model for which a manufacturer requests a waiver. This change indicates Congress' intent that any waivers granted under the new 1977 amendments be narrow in scope and not apply to the entire industry.

On October 13, 1978, EPA published "Guidelines for Applications for Waiver of the 1981 Carbon Monoxide Emission Standard".[5] These guidelines outlined the information which EPA sought from waiver applicants and directed applicants to submit a separate application for each vehicle model for which a waiver was requested. For purposes of the proceedings under section 202(b)(5), the guidelines defined "model" as synonymous with the term "engine family" as defined in 40 CFR 86.077–2 and 86.078–24(a)(2) through (a)(4) (1977).[6]

In response to waiver applications, EPA already has held two sets of public hearings and issued two consolidated decisions pursuant to section 202(b)(5)(A).[7] In those decisions, I denied waivers for certain engine families either because I determined that effective control technology[8] was available contrary to the requirement of section 202(b)(5)(c)(iii) of the Act or because the applicant failed to provide sufficient information to establish that effective control technology was not available. Furthermore, the applicants failed to establish that considerations of costs, driveability, or fuel economy gave me a basis for reaching a different conclusion. I granted the waiver applications covering the remaining engine families after determining that the requisite technology was not available and that the application met each of the statutory criteria for receiving a waiver.

From September 28 through November 2, 1979, the Agency received waiver applications from Toyota, Lotus, Chrysler, AMC, and GM.[9] Specifically, Lotus submitted a new application for three engine families, while GM and Toyota each submitted applications with new emission data for an engine family denied a waiver in the first consolidated decision because of insufficient information. AMC and Chrysler made applications for engine families denied waivers in the first decision and provided some new information. EPA held hearings on these applications on November 5, 1979.[10]

This decision will address the above waiver requests on the basis of previously offered and recently provided information from these manufacturers and from other sources.[11] However, this decision will not address Chrysler's waiver request, which, in addition to providing additional information for some engine families denied waivers in my first consolidated decision, also disputed the first decision in the areas of availability of effective control technology, decision methodology, public health effects, and public interest effects. I will address these issues in a separate opinion specifically responding to the Chrysler submission.

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[1] The first consolidated decision was published at 44 FR 53376 (September 13, 1979). The second consolidated decision can be found at 44 FR 69417 (December 3, 1979).

[2] Regulations were promulgated on August 15, 1979, setting a CO standard of 3.4 gpm for 1981 and later model year vehicles. 40 CFR 86.081–6(a)(1)(ii), 43 FR 37972. This standard requires a 90 percent reduction in CO emissions from the CO standard applicable to 1970 model year vehicles.

[3] Section 202(b)(5)(c) of the Act provides, in part: The Administrator may grant such waiver if he finds that protection of the public health does not require attainment of such 90 percent reduction for carbon monoxide for the model years to which such waiver applies in the case of such vehicles and engines and if he determines that—

(i) Such waiver is essential to the public interest or the public health and welfare of the United States,

(ii) All good faith efforts have been made to meet the standards established by this subsection;

(iii) The applicant has established that effective control technology, processes, operating methods, or other alternatives are not available or have not been available with respect to the model in question for a sufficient period of time to achieve compliance prior to the effective date of such standards, taking into consideration costs, driveability, and fuel economy; and

(iv) Studies and investigations of the National Academy of Sciences conducted pursuant to subsection (c) and other information available to him has not indicated that technology, processes, or other alternatives are available (within the meaning of clause (iii)) to meet such standards.

[4] See the discussion of this point in the introductions to the Administrator's first two consolidated CO waiver decisions. 44 FR 53376 (Sept. 13, 1979) and 44 FR 69422 (December 3, 1979).

[5] 43 FR 47272 (1978).

[6] As in the previous decision, I am distinguishing among engine families primarily on the basis of engine displacement. See footnote 17, second consolidated decision, 44 FR 69418 (Dec. 3, 1979).

[7] Testimony received at these two hearings, as well as all other information considered in deciding these two groups of waiver applications, are included in EPA Public Docket EN–79–4 and EN–79–17, respectively.

[8] As was the case in the earlier consolidated decisions, I am using the term "technology" in this decision to encompass the statutory language "technology, processes, operating methods, or other alternatives" included as part of section 202(b)(5)(c)(iii) of the Act.

[9] Respectively, Toyota Motor Co., Ltd.; Lotus Cars, Ltd.; Chrysler Corporation; American Motors Corporation; and General Motors Corporation.

[10] The transcript from this hearing is located in EPA Public Docket EN–79–19. This decision uses the following abbreviated citations:

AMC App.—American Motors Corporation Petition for Reconsideration dated October 26, 1979.

GM App.—General Motors Corporation Application for Waiver dated November 2, 1979, submitting new information on one engine family.

T. App.—Toyota Motor Co. Ltd. Application for Waiver dated September 24, 1979, submitting new information for one engine family.

L. App.—Lotus Cars Ltd. Application for Waiver dated Oct. 18, 1979.

Other previous submissions are referred to by the abbreviations stated in note 12, first consolidated decision 44 FR 53376, 53377 (Sept. 13, 1979).

[11] See discussion on consideration of other sources of information in previous decisions, e.g. section III B(1)C, 44 FR 69416, 69422 (Dec. 3, 1979).

II. Summary of Decision

A. Waiver Applications Granted

The waiver applications which I decided to grant cover 1981 model year vehicles of the following engine families:

Waiver Applications Granted

Manufacturer	Engine family
Lotus Cars, Ltd	2.0L.
General Motors Corp	3.8L/(231 CID) 4V Turbo.
American Motors Corp	151 CID.

As discussed more fully below, I have concluded that applications covering these engine families meet each of the statutory criteria for receiving a waiver for the 1981 model year. I am prescribing an interim CO emission standard of 7.0 gpm for the 1981 model year for these engine families.[12] However, the statutory 3.4 gpm CO standard will remain effective for the 1982 model year vehicles of these engine families because these applicants have failed to establish that these engine families receiving waivers cannot incorporate effective control technology by 1982.

B. Waiver Applications Denied

I am denying waiver requests covering the following engine families for the model years specified:

Waiver Applications Denied

Manufacturer	Model year denied	Engine family
GM	1982	3.8L/231 CID–4V Turbo.
AMC	1982	151 CID.
Toyota	1981, 1982	108 CID.
Lotus	1981, 1982	2.2L, 2.2L Turbo.
	1982	2.0L.

Toyota has not established that effective control technology, considering costs, driveability, and fuel economy, is not available to enable its 108 CID engine family to meet the statutory CO standard by the 1981 model year. The information in the record indicates that such technology is available for this family.

For the remaining engine families covered by waiver applications which I have denied, the applicants have failed to establish that effective CO control technology will not be available to them because the applicants have not provided sufficient information to permit assessment of the emission control capabilities of these engine families for the model years in question.[13]

Considerations of costs, driveability, or fuel economy, whether viewed separately or cumulatively, do not give me a basis for altering my determinations regarding the availability of technology for these engine families which have been denied waivers. The extra costs associated with implementing technology capable of meeting the 3.4 gpm standard for those engine families, while not necessarily insignificant, are not substantial enough compared to the costs of meeting a standard no higher than 7.0 gpm to justify a conclusion that use of that technology is not feasible.[14] I have determined, therefore, that these costs do not prevent the requisite control technology from being reasonably available to enable these engine families to achieve the 90% reduction in CO emissions which the Act establishes as an ultimate target for light-duty motor vehicles.

Furthermore, no waiver applicant has presented information which indicates that implementing technology capable of achieving the 3.4 gpm standard would have a sufficient adverse effect on driveability, relative to the driveability levels which an applicant reasonably could attain in conjunction with a standard not exceeding 7.0 gpm, to make the vehicles in question unacceptable to consumers.[15] Nor has any waiver applicant demonstrated that implementation of that technology either will prevent the manufacturer from meeting Federal fuel economy requirements or will cause an unreasonable fuel economy penalty relative to fuel economy levels achievable in conjunction with a standard not exceeding 7.0 gpm.[16]

While these engine families denied waivers may meet some, or all, of the remaining statutory criteria for receiving waivers, my determinations regarding available technology, considering costs, driveability, and fuel economy, preclude me from granting waivers covering these engine families.

III. Discussion

A. Availability of Technology

1. Methodology for assessing available technology.—The decisions I have made on whether to grant or deny requested waivers her turn primarily on whether technology is available to enable an engine family covered by one of these waiver applications to meet the 3.4 gpm CO standard in the 1981 model year, as was the case with the first two consolidated decisions. Section 202(b)(5)(C)(iii) of the Act expressly assigns an applicant the task of establishing that effective CO control technology is not available, taking into consideration costs, driveability, and fuel economy. Even if the Administrator determines that an applicant has met this burden, section 202(b)(5)(C)(iv) requires the Administrator to consider whether NAS studies or other information indicate that technology is available considering costs, driveability, and fuel economy, before granting a waiver request.

As was the case in the previous consolidated CO waiver decisions,[17] this consolidated decision relies on information contained in the waiver applications and other information found in the public record. Appendix A assesses the emissions performance of engine families first as described in the waiver application an then after factoring in one or more hypothetical system improvements through the use of "adjustment factors."[18] Appendix A contains this evaluation for each engine family for which sufficient emission test data were available by using a "Monte Carlo" statistical simulation technique used in previous suspension and waiver decisions.[19]

The results from this analysis indicate with high statitical confidence whether the engine families which were covered by waiver applications can certify to the 3.4 gpm CO standard for the 1981 and 1982 model years. Appendix A provides an assessment for each engine family for which adequate emission test data were available and describes the adjustment factors employed in projecting each family's ability to certify.

As part of my assessment of technology, section 202(b)(5)(C)(iv) of the Act requires that I consider the results of NAS studies and

[12] In making determinations for these engine families, I have not considered whether these engine families would be capable of meeting the 3.4 gpm CO standard by replacing their catalysts during their useful life. This is consistent with the policy I applied in the two previous consolidated CO waiver decisions. See 44 FR 53377 (Sept. 13, 1979), 44 FR 69416, 69419 (Dec. 3, 1979).

[13] Applicants providing insufficient emission data may reapply upon submission of new information regarding technology availability for 1982. See 44 FR 53376, 53385 (Sept. 13, 1979) 44 FR 69416, 69418 (Dec. 3, 1979).

[14] See App. A, Sections VI–VIII for discussion of costs, driveability, and fuel economy.

[15] Id., Section VII.

[16] Supra, note 14.

[17] 44 FR 53376, 53389–53402 (September 13, 1979). 44 FR 69416, 69418 and 69419 (Dec. 3, 1979).

[18] The adjustment factors which the methodology employs to account for the effects of the respective improvements to emission control systems often is purposely low compared to measured effects of those factors on emissions. For further discussion, see analysis of adjustment factors in the two previous decisions. 44 FR 53376, 53380 (Sept. 12, 1979), 44 FR 69416, 69421. (Dec. 3, 1979).

[19] See 38 FR 10317, 10323 (April 26, 1973), and discussion of Monte Carlo technique in previous decisions. 44 FR at 53380, 53384, 53390 (Sept. 12, 1979). 44 FR at 69421, 69431 (Dec. 3, 1979).

investigations [20] conducted under section 202(c) of the Act regarding available technology, processes, or other alternatives. For the reasons discussed in my earlier consolidated waiver decisions, the findings of the available NAS studies do not contradict my assessment regarding the unavailability of technology for the engine families for which I have decided to grant waivers for the 1981 model year.[21]

In addition, my review of available technolgy has encompassed other information incorporated into the record from non-applicant manufacturers and from parts suppliers and developers.[22] I also have reviewed dats from emission tests performed on vehicles for the purpose of receiving certification for the 1980 model year, including data regarding certification in California. This additional information, as well as other information available to me, does not indicate that the requisite technology, considering costs, driveability, and fuel economy, is available for the engine families for which waivers are being granted.

2. Individual applicants. Each automobile manufacturer has reached a state in its development of CO emission controls at which it has narrowed the range of strategies it contemplates employing to meet the 3.4 gpm standard. To support contentions that effective control technology is not available, the waiver applicants have provided both descriptions of the systems they have been considering in trying to attain the 3.4 gpm CO emission standard and emission test results they have measured from vehicles incorporating those systems. Each application proposed that I grant the requested waivers to cover engine families produced in both the 1981 and 1982 model years and that a 7.0 gpm CO standard apply to those families. Of the applications under consideration here, only that or Lotus represents a completely new request for a waiver. Toyota and GM are reapplying upon submission of additional emission test data, while AMC is requesting a reconsideration based upon new developments relating to the lead time needed to implement available technology supplied by GM.

a. American Motors Corporation. American Motors (AMC) requested reconsideration of the September 13, 1979, decision denying its application for a CO waiver for the GM-produced 151 CID engine family for model years 1981 and 1982. The previous waiver request was denied because Monte Carlo analysis and information supplied by GM indicated that this family could meet the 3.4 CO standard even considering costs, driveability, and fuel economy.[23] Specifically, the AMC petition is based upon additional information regarding AMC's progress in adapting and calibrating the 151 CID GM-supplied engine and emission control system to AMC vehicles prior to the 1981 model year. AMC contends that delay in obtaining this system from GM and unforeseen problems in engine-vehicle development have hampered its ability to adapt and calibrate this engine package to meet the 3.4 CO standard in time for the 1981 and 1982 model years.

The 151 CID engine for which AMC has requested a waiver is produced by GM and has been employed in vehicles certified by GM. However, GM's 1981 model year version of this engine (i.e., the second generation C-4 system) employs a microprocessor which must be recalibrated for use in AMC vehicles. In the first consolidated waiver decision, I rejected AMC's lead-time contentions based upon projections of AMC's probable ability to adapt, develop, and calibrate this engine family. However, new information indicates that AMC has been unable to achieve significant progress in developing this engine family [24] since the first consolidated waiver decision was announced, and that it has insufficient lead time to develop the requisite calibrations and test them in its own vehicles in time for the 1981 model year. AMC contends that the available 1980 system is incapable of meeting the 3.4 gpm CO standard.

I have therefore determined that effective technology will not be available to AMC with sufficient lead time to meet the 3.4 gpm CO standard in time for the 1981 model year because of its dependence upon GM for engines and emission control technology and because of the amount of time AMC has demonstrated will be involved in implementing that technology in its own vehicles. I have determined, however, that AMC has not established that such technology, considering costs, driveability, and fuel economy, will not be available in 1982 [25] because AMC has sufficient lead time to complete calibration of this system for the 1982 model year.

b. General Motors. General Motors (GM) reapplied for a waiver for its 3.8 liter 4V turbocharged engine family for 1981 and 1982. I denied a waiver for this engine family in my first consolidated CO waiver decision on the grounds that GM provided insufficient emission test data for evaulating the engine family's emission control capabilities.[26]

This reapplication provides additional emissions data and requests that I grant a waiver on the basis of these data and on the basis of GM's assertions that 1) technology for this engine is not available and 2) it is in the public interest to allow the marketing of the turbocharged engine technology.[27]

Appendix A projects this engine family to be unable to meet the 3.4 gpm CO standard in the 1981 model year. The Monte Carlo analysis of GM's extended mileage-emission data predicted that this family had very little probability of passing either the HC or CO statutory standards for 1981.[28] Therefore, I have determined that effective emissions control technology is not available for this engine family for 1981.

Information supplied in GM's application also indicates, however, that this engine family may be capable of meeting the 3.4 CO standard in 1982 by employing additional emission control components or techniques not available for use in the 1981 model year which, because of the additional lead time involved, could be available by the 1982 model year.[29] GM has submitted no data through which I can assess the emissions control capability of this engine family using these potentially available improvements.[30] As a result, I have determined that GM has not established that effective control technology, considering cost, driveability, and fuel economy, will not

[20] Report by the Committee on Motor Vehicle Emissions of the National Academy of Sciences, dated November 1974. See also discussions of the applicability of NAS studies in previous CO waiver decisions. 44 FR at 53376, 53386 (Sept. 13, 1979) and 44 FR at 69416, 69423, 69428 (Dec. 3, 1979).

[21] 44 FR 53376, 53386 (Sept. 13, 1979), 44 FR 69416, 69428 (Dec. 3, 1979).

[22] Much of this information was gathered for and included in the record for the previous consolidated CO waiver decisions. See EPA Public Dockets EN-79-4 and EN-79-17. Those records have been incorporated by reference into the record for this third consolidated decision. EPA Public Docket EN-79-19. See discussion in earlier waiver decisions concerning consideration of alternative sources of information. 44 FR 53376, 53378 (Sept. 13, 1979). 44 FR 69416, 69419 (Dec. 3, 1979).

[23] First consolidated decision 44 FR 53376, 53383 (Sept. 13, 1979). See also App. A, Section IX. AMC has already received a waiver for the 1981-82 NOx standard under section 202(b)(1)(B) of the Act as a small-volume, vendor-dependent manufacturer. See 44 FR 47880 (Aug. 15, 1979).

[24] AMC Pet. pp. 4-8. See also AMC supplemental submission dated Dec. 6, 1979, and App. A, section IX.

[25] App. A, Section IX.

[26] 44 FR 53376, 53385 (Sept. 13, 1979).

[27] App. A, Section IX, GM App. p. 8.

[28] Id., No adjustment factors were applied here because development data demonstrating the effect of any available emission improvements was unavailable.

[29] See App. A, Sections V, IX.

[30] Id., section V.

be available for this engine family for the 1982 model year.

c. Toyota. Toyota reapplied for a waiver for the 108 CID engine family, which was denied a waiver in my first consolidated decision on the basis of lack of sufficient information. Toyota supplied additional emission data and requested a waiver on the grounds that this engine family fails to meet Toyota's emission design targets and thereby fails to give Toyota the assurance it desires that the engine family will meet Federal emission requirements.[31]

Toyota has supplied information for two emissions control systems for its 108 CID engine family, labeled "system A" and "system B".[32] Toyota claims that system B is incapable of meeting the 3.4 CO standard and that system A (for which Toyota claims cost, fuel economy, and driveability penalties relative to system B) requires more development and testing and a possible catalyst change to ensure certification at the 3.4 CO standard.

Monte Carlo analysis of data supplied by Toyota on system A and system B projected that these systems were incapable of meeting the 3.4 gpm CO standard by the 1981 model year. However, the record for this decision also includes emission data from Toyota's 1980 108 CID California certification vehicle 80–CD–1.[33] The Monte Carlo analysis of the emission data from this vehicle indicated with a high degree of confidence that this engine family could pass certification testing at the 3.4 gpm CO standard with a start catalyst adjustment factor.[34]

The projections on available technology based on the Monte Carlo analysis are intentionally conservative in an effort to factor in considerations pertaining to any possible risks that engine families will not meet standards when mass produced. Thus, despite Toyota's concerns that its 108 CID engine family will not meet the design target it sets for itself, I am unable to determine that effective control technology will not be available to enable the 108 CID engine family to meet the 3.4 gpm CO standard.[35]

For reasons articulated in the first consolidated CO waiver decision, Toyota's claims pertaining to cost, driveability, and fuel economy penalties associated with technology available to meet the 3.4 gpm CO standard in 1981 are not accepted here.[36] As a result of the foregoing conclusions, I have determined that technology is available, considering costs, driveability, and fuel economy, to enable Toyota's 108 CID engine family to meet a 3.4 CO standard in the 1981 model year.

Although I was able to make a comprehensive evaluation of Toyota's waiver application, questions arose concerning the sufficiency of information provided in the application as evidenced by Toyota's failure to provide certain data for this engine family.[37] Although these data were otherwise available to EPA, I conisder this type of information to be an important component of any waiver application,[38] specifically where the data pertain to an engine-emission control system configuration that demonstrates the potential ability to meet statutory emission standards.[39]

d. Lotus. Lotus has applied for a waiver of the 3.4 CO standard for all of its engine families, the 2.0L, 2.2L, and 2.2L turbo. In support of its application, Lotus has submitted some emission test data and claimed lack of available effective control technology, development and lead time problems inimical to a low-volume manufacturer, and fuel economy, performance, and cost penalties.

Lotus failed to submit extended mileage emission data (hereinafter "durability data") as specified in the waiver application guidelines.[40] In my decisions on other waiver requests, I have denied waivers for engine families for which an applicant has failed to submit the specified durability data because without those data, I am unable to evaluate the deterioration of emission performance of an engine family over extended mileage.[41]

Section 86.080–24(e) of Title 40 of the Code of Federal Regulations provides that a manufacturer with less than 2000 vehicle sales per year may request a reduction in the number of "durability vehicles" which it would have had to run for purposes of certification testing.[42] Two Advisory Circulars have been issued articulating the Agency's policy to assign deterioration factors (DF) for small volume manufacturers when the cirteria set forth in these circulars for determining eligibility for an EPA assigned DF's in the certification procedure are met.[43] Lotus is a small volume manufacturer eligible for an assigned DF under this policy.

Although this policy was developed for use in the certification procedure, the rationale supporting this policy is equally applicable with respect to these waiver proceedings. The assigned DF was created solely for use by small volume manufacturers to ease the excessive financial burden of testing one or more certification vehicles for a period of 50,000 miles. For a small-volume manufacturer, this financial burden would be distributed over a relatively small number of production vehicles, thereby resulting in an inordinately high cost per vehicle increase. To ease these costs for eligible small-volume manufacturers, EPA developed DF's to predict probable emission control deterioration over the vehicle's 50,000-mile statutorily-defined "useful life."[44] Permitting a small-volume manufacturer the use of an assigned DF in a waiver proceeding would be consistent with allowing the use of an assigned DF in the certification process.

Thus, I am not requiring Lotus, as a small-volume manufacturer which has met all of the criteria specified in Advisory Circular 51A, to provide emission durability data to establish that effective control technology is not available for the engine families for which it has requested waivers. Instead, Appendix A employs a Monte Carlo analysis which applies the DF's EPA

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[31] Id.

[32] App. pp. 1–5.

[33] App. A, Section V.

[34] Id.

[35] Toyota has not provided production vehicle test data supporting the need for or reasonableness of its design targets generally or of the various factors (e.g. prototype-to-production slippage) used to develop those targets. See the discussion in the first consolidated decision at 44 FR 53376, 53384 (Sept. 13, 1979). In addition, the 1980 California durability vehicle of Toyota's 108 CID engine family, which did not employ any improvements, already has produced emission test results during 1980 California certification testing which meet 1981 Federal emission standards. These data tend to confirm the prediction of the Monte Carlo analysis regarding this engine family's ability to meet the 3.4 gpm CO standard.

[36] See also App. A., section VI and section VIII.

[37] App. A. Section V. Toyota's submissions did not refer to the existence of 1980 California certification data on this engine family until after EPA questioned Toyota on that matter at the public hearing. (Nov. 5 Tr., pp. 59–73). Nor did any Toyota submission refer to the existence of confirmatory test data on vehicles from its 1980 California engine family.

[38] See "Guidelines for Applications for Waiver of the 1981 Carbon Monoxide Emission Standard," 43 FR 47272, 47276 (Oct. 13, 1978).

[39] Supra, note 37. See also 43 FR 47272 (1978) and App. A., section V.

[40] 43 FR 47272, 47276 (Oct. 13, 1978).

[41] See 44 FR 53376, 53385 (Sept. 13, 1979), 44 FR 69416, 69427 (Dec. 3, 1979).

[42] Certification testing requires that a "durability vehicle" be tested at 5,000 mile intervals up to 50,000 miles to demonstrate emissions performance over extended mileage. See 40 CFR 86.079–26(a)(4).

[43] Advisory Circular No. 51, October 2, 1975, and A/C No. 51A, February 8, 1979. These circulars provide that, for a manufacturer to be eligible, the manufacturer must show: (a) production of less than 2000 vehicles per year; (b) emission data for one 4,000 mile test vehicle; (c) that the catalyst used is identical to a catalyst employed on a durability vehicle which has successfully completed certification testing; (d) a reasonable relationship between engine displacement and catalyst volume.

[44] 42 USC 7521(d)(1).

assigned to Lotus for its engine families in certification.[45]

Appendix A indicates that application of available technological adjustments to the Lotus 2.0L engine family according to the Monte Carlo simulation does not predict successful certification at the 3.4 CO standard in 1981.[46] However, information supplied by Lotus also indicates that the addition of electronic fuel injection, which is not available for 1981, may enable this family to meet the 3.4 standard in 1982.[47] Lotus has submitted no data through which I can assess the emission control capability of this engine family in 1982. As a result, I have determined that Lotus has not established that effective control technology, considering costs, driveability, and fuel economy, will not be available for this engine family in 1982.

Lotus also did not supply any emission test data which would enable me to assess whether the 2.2L and 2.2l turbo engine families, by using available technology, are capable of meeting the 3.4 gpm standard for the 1981 or 1982 model year.[48] Therefore, I have determined that Lotus has failed to establish that effective control technology, considering costs, driveability, and fuel economy, will not be available for these engine families.

I have not considered Lotus' cost, driveability, or fuel economy concerns for those engine families for which Lotus failed to submit sufficient emission test data because I am unable to determine precisely what emission control equipment Lotus could use to enable these families to meet a 3.4 gpm CO standard of these vehicles.

B. Protection of Public Health

Section 202(b)(5)(C) of the Act requires that before I grant a waiver covering a given engine family, I must find that protection of the public health does not require attainment of a 3.4 gpm CO standard by the vehicles of the engine family receiving the waiver. Thus, I have examined this issue with respect to the three engine families for which I have determined that effective control technology, considering costs, driveability, and fuel economy, is not available in model year 1981. I have found as a result of this examination that any adverse health effects resulting from waiving the 3.4 standard for these 1981 model year engine families would be insignificant. The same statement is true regarding the combined health effects resulting from waiving the 3.4 standard for the 1981 model year for these engine families and for all the 1981 and 1982 model year engine families receiving waivers under the previous consolidated CO waiver decisions. As a result, protection of the public health does not require attainment of the 3.4 gpm CO standard for the engine families for which I have determined that effective control technology is not available for the 1981 model year.[49]

According to the express terms of the statute, there is no need for me to determine whether waiver applications covering engine families for which applicants failed to establish the unavailability of effective control technology (considering costs, driveability, and fuel economy) meet any of the remaining statutory criteria in order for me to deny these applications. The Act requires me to deny waiver applications where an applicant has failed to meet any one of the criteria, regardless of whether such applicant could meet the remaining criteria. Nevertheless, I will address these issues briefly in the course of discussing the remaining criteria as I did in the two previous waiver decisions.[50]

While waiving the 1981 and 1982 statutory CO standards for any one of the engine families covered by a waiver application arguably would not significantly affect the public health, noticeable increases in ambient CO levels could result from granting waivers industry-wide. In light of the fact that industry-wide waivers would not be protective of the public health, it is reasonable to grant waivers covering only that portion of the industry [51] consisting of engine families for which I have determined that effective control technology, considering costs, driveability, and fuel economy, is not available (presuming these families also meet the remaining statutory criteria).[52]

C. Essential to the Public Interest or to the Public Health and Welfare

Before I may grant a waiver request, section 202(b)(5)(C)(i) of the Act requires that I determine that granting the waiver is essential to the public interest or the public health and welfare.[53] I have determined, however, that granting waivers to the three engine families for which I have determined that effective control technology is not available in the 1981 model year is essential to the public interest. By granting these waivers, I will permit these manufacturers to market engine families which they otherwise most likely would not have been allowed to market.[54] Granting waivers for this reason is essential to the public's interest in maintaining a diversified and competitive automotive industry for the United States market.

GM asserted that granting a waiver to this engine family would serve the public interest by allowing the marketing and development of innovative turbocharger technology and its claimed associated fuel economy and performance benefits.[55] In addition, Lotus claimed that it is further essential to the public interest that I grant its requested waivers to allow it to continue producing high performance vehicles which demonstrate innovative safety or engineering features.[56]

These waivers may further serve the public interest to the extent that they permit certain innovative emissions control, safety, driveability, or fuel economy features available in conjunction with engine families which applicants could not have marketed without waivers.[57] However, my determination that these waivers are essential to the public interest does not rely upon consideration of these innovative features.

With respect to these three engine families in the 1982 model year, and with respect to the remaining engine families at issue here, I have determined that it is not essential to the public interest to grant waivers to these families, which are capable of meeting a

[45] App. A., section V.
[46] App. A., section IX.
[47] Id.
[48] App. A., section V. See also Lotus App., p. 5.
[49] See 44 FR 53376, 53382 and 53402 (Sept. 13, 1979), and 44 FR 69416, 69429 and 69456 (Dec. 3, 1979).
[50] Criteria found at section 202(b)(5)(C) (i–iv) of the Act. See 44 FR 53376, 53378 (Sept. 13, 1979) and 44 FR 69416, 69420 (Dec. 3, 1979).
[51] Several applicants disagreed with this interpretation. See, e.g., GM App., p. 6, T. App., p. 1–8. For further discussion concerning these contentions see first decision 44 FR 53376, 53381 and App. B at 44 FR 53402–53407 (Sept. 13, 1979).
[52] See discussion of ambient air quality effect of granting CO waivers as found in Appendix B in both decisions, 44 FR 53376, 53402–53407 (Sept. 13, 1979) and 44 FR 69416, 69456–69462 (Dec. 3, 1979). The engine families receiving waivers under both the first and second consolidated CO waiver decisions only constitute approximately 12% of total projected 1981 model year light-duty vehicle sales in the United States. Adding the engine families here increases this figure to 13.2%.
[53] See sections in previous decisions discussing public health and welfare effects of engine families denied waivers, 44 FR 53387, 44 FR 69429 (Sept. 13, 1979 and December 3, 1979).
[54] Supra, note 14. I rejected the alternative of allowing these models to be marketed with the requirement of an expensive catalyst change.
[55] GM App. p. 8. As explained in Appendix A, the use of a turbocharger does not in itself improve economy, but rather allows the use of smaller displacement engines which could be more fuel efficient.
[56] Cf. App. A, Section IX, L. App., p. 1.
[57] See also 44 FR 53387 (Sept. 13, 1979), citing 123 Cong. Rec. S. 13707 (Aug. 4, 1977) (remarks of Sen. Muskie).

3.4 gpm CO standard but which incur costs (or driveability or fuel economy penalties) in meeting the 3.4 gpm CO standard. No applicant has established here that the costs (or penalties) involved are so substantial as to present a significant risk to the waiver applicant's ability to produce and competitively market vehicles of that engine family, or vehicles generally.[58]

Finally, certain applicants[59] asserted that denial of waiver applications for certain engine families could preclude introduction of these fuel efficient vehicles, thereby compromising the manufacturer's ability to comply with Corporate Average Fuel Economy (CAFE) standards.[60] However, no manufacturer has established that any such family cannot meet the 3.4 CO standard; thus, no manufacturer has established that it will be unable to market such a family and use the fuel economy performance of that family to comply with CAFE requirements.

D. Good Faith

In order for me to grant a waiver to any applicant, section 202(b)(5)(c)(ii) of the Act requires that I determine that the applicant in question has made all good faith efforts to meet the emission standards established by this subsection. As a result, I have examined information regarding each applicant's previous and projected efforts toward meeting a 3.4 gpm CO emission standard for the engine families in question.

Each of the waiver applicants contended that it has acted in good faith in trying to meet the 3.4 gpm CO standard. In general, information in the record provides support for determining that each of the applicants has met the Act's good faith criterion[61] in developing emission control technology to meet the 3.4 gpm CO standard, although some applicants made only marginal showings.[62] In the absence of any other evidence supporting a contrary conclusion, however, I have determined that each of the applicants has met the good faith criterion with respect to each of the three engine families for which I have determined effective control technology to be unavailable in the 1981 model year.[63]

My conclusion regarding this criterion with respect to engine families for which waiver applicants failed to establish the unavailability of effective control technology, considering costs, driveability, and fuel economy, is the same as my conclusion regarding the good faith criterion with respect to engine families which do not have effective control technology available in the 1981 model year. Specifically, since I have no evidence which would enable me to determine other than that all applicants have met the good faith criterion of the Act, I find that all applicants have met this criterion.[64]

E. Risks in Determining Available Technology

In *International Harvester Co.* v. *Ruckelshaus,*[65] the Federal appellate court reviewed the Administrator's decision to deny manufacturers' requests for a one-year suspension (from 1975 to 1976) of the effective date of the statutory hydrocarbon (HC) and CO standards mandated by the 1970 version of the Act. The court stated, among other things, that the Administrator should have balanced the risk associated with erroneously denying the suspension requests versus the risk associated with erroneously granting them. The court indicated that the balancing process should consider the economc costs (in terms of jobs and misallocated resources) possibly associated with an erroneous denial versus the possible environmental benefits lost through an erroneous grant.

Even though the health risks associated with erroneous grants in the proceedings at hand may not be great, the risks associated with erroneous denials (which do not involve health considerations) also are limited significantly. My findings that technology is available for an engine family to meet certification testing requirements are based on conservative projections.[66] The move from today's state of technology to the technology required to achieve the 3.4 CO standard does not require any substantial shift to untried emission control methods. Furthermore, an incorrect determination here would have the potential to adversely affect the production of only one engine family, as opposed to the ability of the industry as a whole to produce cars for the public generally. In light of these counterbalancing risks, and in light of Congress' expressed intent to afford a statutory waiver only in exceptional circumstances rather than on an across-the-board basis,[67] I have concluded that it is appropriate to deny waiver applications insofar as they cover engine families for which the manufacturer had failed to establish that effective control technology, considering costs, driveability, and fuel economy, is available.

F. Conclusion

The three engine families for which I have determined that effective CO control technology is not avaiable for the 1981 model year are covered by waiver applications which meet each of the remaining criteria under section 202(b)(5)(C) of the Act. As a result, I am granting a waiver of the effective date of the 1981 statutory CO emission standard for the Lotus 2.0L, AMC 151 CID and Gm 3.8L/4V turbo engine families for the 1981 model year.

For the remaining engine families, the applicants have failed to establish that effective control technology is not avaiable for those families, considering costs, driveability and fuel economy. I have determined for Toyota's 108 CID engine family that effective control technology indeed is available to meet a 3.4 gpm CO standard by the 1981 model year, even after considering costs, driveability and fuel economy. I also have determined that AMC has failed to establish that lead-time constraints prevent effective control technology, considering costs, driveability, and fuel economy, from being available to enable its 151 CID engine family to meet a 3.4 gpm CO standard in the 1982 model year. Finally, I have determined that 1) GM has failed to provide sufficient emission data to establish that such technology, considering costs, driveability, and fuel economy, is not available for its 3.8L/4V turbo engine family in the 19832 model year, and 2) Lotus has failed to provide sufficient emission data to establish the unavailability of such technology, considering costs, driveability, and fuel economy, for its 2.0L engine family in

[58] See also public interest analysis in previous two decisions regarding engine families denied waivers, 44 FR 53376, 53385 (Sept. 13, 1979) and 44 FR 69416, 69430 (Dec. 3, 1979).

[59] See App. A, section VIII.

[60] See section VIII of Appendix A of the second decision and discussion in section III(C)(1)(b)(iii) of that decision. 44 FR at 69428 (Dec. 3, 1979). The so-called CAFE rquirements are the manufacturers' sales-weighted fuel economy standards set under § 502 of the Energy Policy Conservation Act, Pub. L. No. 94–163, 89 Stat. 871 (1975).

[61] 42 U.S.C. 7521(b)(5)(C)(iii).

[62] See App. A, Section V. GM, for example, failed to supply development information regarding alternative emissions control technology for its 3.8 L/4V turbo engine family.

[63] See discussion of good faith criterion for engine families granted waivers in my two previous decisions 44 FR 53376, 53383, (Sept. 13 1979), 44 FR 69416, 69424. (Dec. 3, 1979).

[64] See previous decisions. 44 FR 53376, 53383 (Sept. 13, 1979), and 44 FR 69416, 69424 (Dec. 3, 1979).

[65] 478 F. 2d 615 (D.C. Cir. 1973). For further discussion of this case, see 2nd decision, 44 FR 53376, 53388 (Sept. 13, 1979). Also see the discussion of the 1970 version of the Act in section I of this decision.

[66] App. A, Section V.

[67] Supra, note 23. See also discussion of this case in the two previous decisions 44 FR 53376, 53387 (Sept. 13, 1979), 44 FR 69416, 69429 and 69430. (Dec. 3, 1979). Lotus in particular raised the question of risk as applied to small-volume manufacturers (L. App., p. 1).

the 1982 model year, and for its 2.2L and 2.2L Turbo engine families for the 1981 and 1982 model years.[68] Thus, even though these waiver applicants may meet one or more of the remaining statutory criteria for receiving waivers, I nevertheless must deny the waiver applications covering these remaining engine families.

IV. Interim CO Exhaust Emission Standards

As required by section 202(b)(5)(A) of the Act, I am simultaneously promulgating regulations prescribing an interim CO emission standard for 1981 model year vehicles of 7.0 gpm for the three engine families receiving waivers. For these three engine families, this action continues in effect for one additional model year the CO emission standard applicable to all 1980 model year light-duty vehicles.

Dated: January 22, 1980.

Douglas M. Costle,

Administrator.

Appendix A

Contents

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I. Introduction

The exhaust emission standards for 1981 and later model year light-duty vehicles are currently 0.41 gram per mile HC, 3.4 grams per mile CO, and 1.0 gram per mile NO_x. Section 202(b)(5)(A) of the Clean Air Act, as amended, 42 U.S.C. 7521(b)(5)(A) provides the opportunity for manufacturers to request a waiver of the 3.4 grams per mile CO standard to 7.0 grams per mile during model years 1981 and 1982.

The applicants being considered in this document are American Motors (AM), General Motors (GM), Lotus, and Toyota. This is the third group of CO waiver applications that have been considered by EPA. This is the second time that waiver requests have been considered by EPA from AM, GM, and Toyota. Chrysler has again requested a waiver for some of their engines. The Chrysler request will be discussed in a later document.

This appendix deals with the technological capability of those manufacturers to meet the 1981 and 1982 CO standard of 3.4 grams per mile. This appendix relies on three previous technical appendixes, particularly for discussion of the Monte Carlo simulation utilized in this analysis. These appendixes are:

1. Appendix B, Technical Appendix, to the Decision of the Administrator on Remand for the United States Court of Appeals for the District of Columbia Circuit, April 11, 1973.
2. Appendix A, Technical Appendix, to the Decision of the Administrator In re: Applications for Suspension of 1976 Motor Vehicle Exhaust Emission Standards, July 30, 1973.
3. Appendix A, Technical Appendix, to the Decision of the Administrator In re: Applications for Suspension of 1977 Motor Vehicle Exhaust Emission Standards, March 5, 1975.

As indicated in Section 202(b)(5)(c)(iii), the technological feasibility determination is based on the consideration of technological capability, cost, driveability, and fuel economy. This appendix contains discussion of each of the above topics.

II. Summary of Technological Capability

Tables II–1 to II–4 summarize the capability of the four applicant manufacturers to meet the 1981 and 1982 emission standards. The standards considered in these tables are 0.41 HC, 3.4 CO, 1.0 NO_x.

A guide to the summary tables is as follows: The first column lists engine displacement. The second column, which lists per cent of model year 1981 sales, is deleted because the values were derived in most cases from manufacturers' confidential sales estimates. The "as received" column refers to the emission data submitted by the manufacturer. "Improvements" refer to the projected technological improvements (factors) applied to the data submitted by the manufacturer.

The "no data" category is an abbreviated notation for the lack of acceptable data to perform EPA's technological analysis. The applicants have known for about six years what sort of data is necessary for EPA to make a determination whether or not a given vehicle would be projected to pass or fail a set of standards. Unfortunately, in many cases there was a lack of acceptable data for vehicles using specific engines. This effectively precluded EPA from making a pass/fail determination for those vehicles. In these cases the vehicles using these engines are called "no data" and no pass/fail determination was made.

Table II–1.—*Applicant: American Motors*

Engine	Percent estimated 1981 sales	Pass as received?	Pass with improvement?
151 CID		No, because lead time problems may not permit successful certification in 1981.	NA.[1]
		Yes in 1982	NA.

[1] NA means not applicable or that no hardware improvement factors were applied to these vehicles.

Table II–2.—*Applicant: General Motors*

Engine	Percent estimated 1981 sales	Pass as received?	Pass with improvement?
231 CID/3.7L-TC-4V		No for 1981	NA.[1]
		No data for 1982	No data for 1982.

[1] NA means not applicable or that no hardware improvement factors were applied to these vehicles.

Table II–3.—*Applicant: Lotus*

Engine	Percent estimated 1981 sales	Pass as received?	Pass with improvement?
2.0L		No for 1981	NA.[1]
		No data for 1982	No data.
2.2L		No data	No data.
2.2L Turbo		No data	No data.

[1] NA means not applicable or that no hardware improvement factors were applied to these vehicles.

Table II–4.—*Applicant: Toyota*

Engine	Percent estimated 1981 sales	Pass as received?	Pass with improvement?
108 CID		Yes	Yes.

III. Statistical Treatment of the Data

No changes have been made in the basic Monte Carlo methodology since its last use in a technical appendix. This methodology has been discussed in three previous technical appendixes:

1. Appendix B, Technical Appendix, to the Decision of the Administrator on Remand for the United States Court of Appeals for the District of Columbia Circuit, April 11, 1973.
2. Appendix A, Technical Appendix, to the Decision of the Administrator In re: Applications for Suspension of 1976 Motor

[68] App. A, Section V.

Vehicle Exhaust Emission Standards, July 30, 1973.

3. Appendix A, Technical Appendix, to the Decision of the Administrator In re: Applications for Suspension of 1977 Motor Vehicle Exhaust Emission Standards, March 5, 1975.

IV. Factors

With respect to the vehicle emission data submitted by the manufacturers for EPA analysis, vehicles are often run and tested over durability mileage accumulation schedules without using the best technology that is available to the manufacturer for certification in the 1981 model year. There are many reasons why this occurs. First, such technology may have simply not been available in quantity when fleets of vehicles began mileage accumulation. Second, all vehicles submitted for EPA staff analysis may not have been specifically designed for the 1981 and 1982 Federal emission standards. Also the manufacturer may wish to maintain some technologies (with known durability) in reserve if their low mileage testing indicates that such technology may not be needed for compliance with the target emission standards. In addition, technology may not appear on durability vehicles because the manufacturer has made a decision that the technology would be too costly for production vehicles.

To account for the fact that the applicants did not in all cases conduct durability testing with the most effective emission control hardware, factors have been applied to some of the emission data submitted by the manufacturers to simulate the addition of more effective systems. Due to substantial lead time problems for implementation of new or additional technology by the 1981 model year, these factors have been applied only for currently known hardware that can be implemented in 1981 or 1982 certification and production. These improvements have been basically limited to additional catalyst (i.e., the addition of oxidation catalyst in some cases), the addition of air injection, and additional catalyst noble metal loadings. Other improvements in hardware were considered if the manufacturer indicated that they were available for 1981 or 1982.

The factors that have been applied to the data are dimensionless numbers that represent the improvement in emission performance that is predicted for the more effective simulated emission control technology. The factors are derived from data that reflect the emission performance of a vehicle with and without the more effective technology. For example a factor for CO of 0.90 indicates that a 10% reduction in CO is projected for the use of the more effective technology. In addition, when there are several different sources for the same improvement, EPA uses a conservative estimate of that projected factor, i.e., a factor greater in absolute value than that indicated by most of the data.

Other factors which were developed, but generally not used in the following analysis include factors for:

Warm up catalysts for 3W catalyst or 3W + OC systems
Deletion of power enrichment
Use of insulated or dual-walled exhaust pipes
Use of exhaust port liners
Use of throttle body fuel injection
Use of multiple point fuel injection
High energy ignition

Although the deletion of power enrichment and the use of insulated or dual-walled exhaust pipes were considered feasible for 1981, they were generally not used. Therefore, through these additional techniques, the manufacturers may have some additional cushion for certification over and above the factors used in EPA's analysis. Use of the other items was not considered possible for most manufacturers for most engine families before the 1982 model year.

Oxidation Start Catalyst Factor

The available CO control technology includes light-off or start catalysts. Start catalysts are small in size, have low thermal inertia and are mounted close to the engine. This combination of factors leads to rapid light-off for the start catalyst, which tends to lower HC and CO emissions.

The data used to develop the oxidation start catalyst factor came from Automobile Emission Control—The Current Status and Development Trends as of March, 1976 (S.R. 1976) page 4–14, and from subpoenaed information from Engelhard Industries [18 at Section II].* These data are shown in Table IV–3.

Table IV–1.—*Start Catalyst Effect*

	HC	CO	NO_x
	0.48	0.36	1.01
	0.62	0.45	1.00
	0.70	0.66	1.00
	0.60	1.01	0.98
	0.57	0.46	0.90
	0.68	0.72	1.20
	0.25	0.62	0.78
Average Factor as Calculated	0.56	0.61	0.98
Factor as used in Monte Carlo	.7	.7	1.0

V. Discussion of Individual Manufacturer's Technical Capability

This section will discuss all vehicles which (1) were submitted by each of the four applicants and (2) also are acceptable for input into the Monte Carlo simulation. Acceptable for input means (1) that the vehicle is a durability vehicle which has accumulated a minimum of 20,000 miles with the same major emission control components and (2) that a minimum of four valid 1975 FTP tests have been conducted on the vehicle.

Details of the pass/fail determinations in section II are also presented here. To pass the 1981 and 1982 emission standard (of 0.41 HC, 3.4 CO, 1.0 NO_x), the probabilities of passing each individual pollutant must be greater than or equal to 80%. If the probability of passing only HC, for example, is less than or equal to 79%, the vehicle fails—even if the probabilities for CO and NO_x greatly exceed 80% cutpoint.

Due to time for analysis, pass/fail analysis is provided only for emission standards of 0.41 HC, 3.4 CO and 1.0 NO_x. Analysis of the capability of the vehicles to meet the standard of 0.41 HC, 7.0 CO, 1.0 NO_x was not conducted. Consequently, vehicles designed for standard are included in the following discussions of vehicles which were acceptable for entry into the computer analysis, but are not discussed with respect to compliance at 7.0 CO.

In order that the Monte Carlo analysis not be cluttered with hundreds of failing vehicles utilizing inappropriate technology, prior certification vehicles are not considered in this analysis except in special cases where a manufacturer's ability to comply with the 1981 and 1982 emission standards is directly affected. It is not surprising that the durability vehicles from past certification would fail to achieve the 3.4 CO standard for two reasons. First, the 3.4 CO standard represents a substantial reduction in CO from prior model year standards. And second, major changes in technology are being planned for introduction in 1981 by most vehicle manufacturers to achieve the more stringent standards.

If a manufacturer's prime (prime means the system most capable of achieving the 1981 standards) 1981 emission control system has been tested in prior certification (generally 1980), these data are included in the analysis.

American Motors (AM)

The American Motors waiver request for vehicles using the 151 CID engine is very unique. General Motors is the supplier of both the engine and emission control system to AM. AM and GM have previously been denied a waiver for models using this engine because the technology is available to allow these vehicle to certify at 0.41 HC, 3.4 CO, 1.0 NO_x. This determination was made on the basis of GM vehicle Z–721 (not vehicles Z–721 and Z–625 as stated in the first consolidated decision). Since vehicles Z–625 and Z–721 used different emission control systems, the initial decision regarding the 151 CID engine would not have changed.

The status of the 1981 GM certification vehicles further supports the contention that the technology is available. The Monte Carlo results of the three 1981 Federal GM vehicles (which have accumulated 20,000 or more miles) are shown in Table V–1. The actual emissions data from those three vehicles are show in Table V–2. Barring any unforeseeable problems, two of the three GM vehicles appear to be approaching successful certification. Thus, all indications are that the two families will pass and that technology is available. Also, there is not doubt that GM has offered to provide the same technology to AM [12 at 4 to 8 and 12 at Appendix A].

* The notation [W at Y] means the reference is reference number W from section X of this document at page number Y.

Table V-1.—*The Monte Carlo Results of 1981 Federal Certification Vehicles From GM Using 151 CID Engines (as Received)*

VIN	Emission control system	Catalysts	Probabilities of pass		
			HC	CO	NO_x
1200	FBC/EGR/AIR/ESA/3W/OC	3428/2961	83	98	100
1201	FBC/EGR/AIR/ESA/3W/OC	3480/4044	59	5	100
1202	FBC/EGR/AIR/ESA/3W/OC	3480/4048	100	99	100

Table V-2.—*1981 Federal Certification Results of GM Vehicles With 151 CID Engines*

VIN	IW	Trans	Miles	HC	CO	NO_x	MPG_e	Comments
1200	3000	A3	4,857	.15	1.07	.47		Reference 14, p. 85.
			10,058	.23	1.49	.49		
			14,894	.20	1.21	.48		
			20,138	.24	1.75	.46		
			25,077	.20	1.44	.57		
			30,05	.21	1.58	.47		Before maintenance.
			30,049	.23	2.05	.48		After maintenance.
			34,775	.20	1.77	.49		
			39,763	.40	1.79	.48		
			Calc 4K [1]	.16	1.19	.48		
			Calc 50K [1]	.33	2.10	.50		
			Df [1]	2.05	1.77	1.03		
1201	3000	A3	4,796	.25	2.49	.46		Reference 14, p. 87.
			9,778	.14	0.84	.47		
			15,026	.35	3.26	.45		
			19,803	.35	3.53	.47		
			24,839	.32	3.38	.46		
			30,011	.29	3.28	.40		Before maintenance.
			30,042	.31	3.06	.49		After maintenance.
			Calc 4K [1]	.23	1.98	.47		
			Calc 50 K [1]	.40	4.57	.44		
			Df [1]	1.74	2.31	.94		
1202	3000	A-	4,880	.09	0.50	.65		Reference 14, p. 89.
			10,092	.13	0.57	.61		
			15,075	.11	0.68	.63		
			19,940	.10	0.96	.60		
			24,776	.10	0.67	.65		
			29,912	.13	0.97	.65		Before maintenance.
			Calc 4K [1]	.10	0.50	.62		
			Calc 50K [1]	.13	1.27	.65		
			Df [1]	1.27	2.56	1.04		

[1] Based on less than the complete 50,000 miles of durability required for certification.

The unique part of the AM waiver request is that they apparently do not want to purchase the 1981 GM hardware, at least for Federal use in model year 1981. The reason for not wishing to purchase the hardware is inadequate lead time, according to AM [5 at 126 to 135]. This issue is discussed at length in the lead time section of this appendix. On the basis of lead time, the technical staff determined that AM would be unable to certify to a 3.4 CO standard in the 1981 model year. In 1982 AM is projected to be able to certify vehicles using the 151 CID engine to a 3.4 CO standard.

General Motors

This is the second waiver application which has been submitted by General Motors. The first application requested a waiver for virtually all of the 1981 and 1982 model GM vehicles. The current application requests a waiver for only those 1981 and 1982 models using the 3.8L/231 CID turbocharged engine with a four barrel feedback carburetor. Other basic emission components used on vehicles with these engines include back-pressure EGR, switched AIR injection, and a 3-way plus oxidizing catalyst.

No prototype durability vehicles were run by General Motors. Emission data were presented by GM for a total of eight 1980 and 1981 certification vehicles as shown in Table V–3. Only one of the vehicles (car number 59147) which were acceptable for Monte Carlo analysis was actually targeted for the 1981 Federal emission standards. The remaining four vehicles in the Monte Carlo analysis were designed for compliance with the 1980 California standards of 0.39 NMHC, 9.0 CO, 1.0 NO_x.

In the as received condition, none of the five vehicles passed as shown in Table V–4. All failed the 3.4 CO emission level, and only one passed the 0.41 HC level. Since no developmental emission data were reported by GM for vehicles using this engine, no hardware improvement factors could be applied.

The EPA technical staff believe that the use of known emission control techniques such as improved air/fuel metering systems, start catalysts, increased volume monolithic catalysts, and exhaust port liners will improve the emissions of this engine. Due to lead time constraints these components could not be applied in time for the 1981 model year, but they could be available for 1982.

Table V-3.—*Vehicles in GM Waiver Application*

Engine and VIN	Emission control system	Entered in Monte Carlo?	If not entered in Monte Carlo—why?	Comment	Reference
231–TC–4V, 5969	FBC/BPEGR/AIR/ESA/3W/OC...	Yes		1980 California certification vehicle	17 at A–2 to A–3.
231–TC–4V, 5970	FBC/BPEGR/AIR/ESA/3W/OC...	Yes		1980 California certification vehicle	17 at A–6 to A–7.
231–TC–4V, 5971	FBC/BPEGR/AIR/ESA/3W/OC...	Yes		1980 California certification vehicle. Terminated due to carburetor solenoid failure.	17 at A–10 to A–11.
231–TC–4V, 48392	FBC/BPEGR/AIR/ESA/3W/OC...	Yes		1980 California certification vehicle. Terminated due to turbocharger failure.	17 at A–14 to A–15.
231–TC–4V, 48393	FBC/BPEGR/AIR/ESA/3W/OC...	No	Insufficient mileage accumulation.	1980 California certification vehicle. Terminated due to failure of throttle position switch.	17 at A–18 to A–19.
231–TC–4V, 59145	FBC/BPEGR/AIR/ESA/3W/OC...	No	Insufficient mileage accumulation.	1981 certification vehicle. Terminated for high emissions	17 at A–22 to A–23.
231–TC–4V, 59147	FBC/BPEGR/AIR/ESA/3W/OC...	Yes		1981 certification vehicle	17 at A–26 to A–27.
231–TC–4V, 59148	FBC/BPEGR/AIR/ESA/3W/OC...	No	Insufficient mileage accumulation.	1981 certification vehicle. Terminated for high emissions	17 at A–30 to A–31.

Table V-4.—*Monte Carlo Results of GM Vehicles Using 231-4V Turbocharged Engines*

VIN	IW	Trans	3W [1] catalyst code	OC [1] catalyst code	Electronics [2]	Probability of pass		
						HC	CO	NO_x
5969	3500	A	3256(P)	2789(P)	Proto III	35	[illegible]	[illegible]
5970	3500	A	3339(M)	2886(M)	Proto III	85	17	100
5971	3500	A	3293(P)	2576(P)	Proto III	23	[illegible]	[illegible]
48392	3500	A	3428(M)	2961(M)	Proto III	[illegible]	[illegible]	[illegible]
59147	[illegible]	L	3339(M)	[illegible]	Proto IV	[illegible]	[illegible]	100

[1] The catalyst code is a GM code number. It is always prefixed with the letters HN. The suffixes (P) or (M) mean pelleted or monolithic catalysts.

[2] Digital Prototype III systems have electronic control of air/fuel ratio, spark advance, and air switching. Digital Prototype IV systems have electronic control of air/fuel ratio, spark advance, air switching, evaporative canister purge, EGR and EFE vacuum, and the transmission converter clutch.

Since GM has not reported test results using any of these components, this family is considered to be a "no data" family for model year 1982. It is projected to fail in the 1981 model year.

Lotus

Lotus has requested a CO waiver for the three engines it plans to market for the 1981–1982 model years. These engines include the 2.0L, 2.2L, and 2.2L turbocharged engines.

Lotus stated that their first choice emission control system for meeting the 1981–1982 standards consisted of a three way catalyst with open loop carburetion and an aspirator system [5 at 28]. This system is also being used for 1980 California vehicles.

Lotus is also in the process of developing a closed loop fuel injection system which will be available (see discussion in the Lead Time Section) for the 1982 model year. Lotus did not submit emissions data for their emission control system with fuel injection. Lotus did not submit durability data. Lotus is a small volume manufacturer and is not required to run durability vehicles in their certification process as they receive assigned deterioration factors from EPA.

The EPA technical staff assumed that Lotus would receive the currently assigned d.f.'s of 1.3, 1.2, and 1.1 for HC, CO and NO_x respectively for their 1981–1982 model year vehicles. Lotus only submitted data on three vehicles, one emissions development vehicle (132S) and two fuel economy vehicles (499B and 387E). These vehicles were assigned suffix numbers by EPA for each test to help distinguish between tests (e.g. 132S was assigned 132S–1 etc.), and are listed in Table V–5 and in the Monte Carlo results with the EPA assigned vehicle identification numbers. Table V–5 lists the data submitted by Lotus and only includes tests performed according to the 1975 Federal Test Procedure.

Table V-5.—*Vehicles in Lotus Waiver Application*

	VIN	Emission control system	Test No.	Entered in Monte Carlo	If not entered in Monte Carlo, why?	References
Engine disposal (L):						
2.0	132S–1	3W/EGR	187901	Yes		6 at 1.9.
2.0	132S–2	3W/EGR	187904	Yes		6 at 1.11.
2.0	132S–3	AIR/OC	207902	Yes		6 at 1.13.
2.0	499B–1	PAIR/OC	307917	Yes		6 at Test No. 307917.
2.0	499B–2	PAIR/OC	357916	Yes		6 at Test No. 357916.
2.0	132S–4	AIR/3W/EGR	237911	Yes		6 at 1.15.
2.0	132S–5	AIR/3W/EGR	277902	Yes		6 at 1.17.
2.0	132S–6	AIR/3W/OC	287909	Yes		6 at 2.2.3.
2.0	132S	None	117901	No	No emission control system.	6 at 2.3.1.
2.0	132S	None	117903	No	No emission control system.	6 at 2.3.3.
2.0	132S–7	3W	197902	Yes		6 at 2.3.5.
2.0	132S–8	3W	197903	Yes		6 at 2.3.7.
2.0	132S–9	3W	207901	Yes		6 at 2.3.9.
2.0	132S–10	PAIR/3W	297910	Yes		6 at 2.3.13.
2.0	132S–11	PAIR/3W	307901	Yes		6 at 2.3.17.
2.0	132B–12	PAIR/3W	307906	Yes		6 at 2.3.19.
2.0	132S–13	PAIR/3W	307907	Yes		6 at 2.3.21.
2.0	132S–14	PAIR/3W	307908	Yes		6 at 2.3.23.
2.0	387E–1	PAIR/3W	297912	Yes		6 at Test No. 297912.
2.0	387E–2	PAIR/3W	317906	Yes		6 at Test No 317906.

To facilitate application of the Monte Carlo, each test was treated as a 4000 mile test regardless of the actual mileage on the catalysts or the vehicles. For vehicle 132S, catalyst miles ranged from 300 to 2100 miles, and vehicle miles ranged from 3000 to 6000 miles. The test points for vehicles 499B and 387E fell between 4500 and 4700 miles. Of the 18 tests included in the Monte Carlo analysis, only four tests were performed with more than 4000 miles on the catalyst. For tests where the catalyst had less than 4000 miles on it, this procedure results in a conservative approximation of what would be the actual 4000 mile test point. This was the case for the 14 tests on vehicle 132S. Treating the four tests on vehicles 499B and 387E, as 4000 mile tests was more stringent than would actually be the case in certification, but the effect was insignificant.

In order for the Monte Carlo simulation to function properly, at least four test points are required. A feature of the computer program requires at least one of these points not to fall on the straight line between the 4000 mile point and the 50,000 mile point. The 50,000 mile test point was calculated by multiplying the estimated 4000 mile test point by the aforementioned d.f.'s. In order to generate two more test points, the 50,000 mile point was divided by 2 and the result used as the 26000 mile and 28000 mile test points. Part II of the Monte Carlo results (Deterioration Calculations) indicate a slight error in the d.f. calculations which was caused by rounding to only two decimal places for the three generated test points. The EPA technical staff judged that the errors created by these procedures did not affect the pass/fail situation of the Lotus vehicles.

Pass/Fail Analysis for the Lotus 2.0 L Engine

The 2.0 L engine is projected to fail in 1981 and is considered a "no data" case for 1982. As shown in Table V–6, none of the vehicles passed the Monte Carlo simulation, and based on these results, the 2.0 L engine is projected to fail in 1981. In 1982 a new emission control system will be available to Lotus, which will include a closed-loop fuel injection system. Because Lotus did not submit any data on this system, the 2.0 L engine is considered to be a no data case for 1982.

Table V–6.—*Monte Carlo Results of Lotus Vehicles Using the 2.0L Engine*

VIN	Emission control system	Probability of pass		
		HC	CO	NO_x
132S–1	3W/EGR	0	0	[illegible]
132S–2	3W/EGR	19	0	[illegible]
132S–3	AIR/OC	0	0	0
132S–4	AIR/3W/EGR	0	0	100
132S–5	AIR/3W/EGR	0	100	70
132S–6	AIR/3W/EGR	0	33	69
132S–7	3W	0	0	[illegible]
132S–8	3W	0	0	[illegible]
132S–9	3W	0	0	69
132S–10	Pair/3W	7	0	69
132S–11	Pair/3W	40	0	70
132S–12	Pair/3W	30	0	67
132S–13	Pair/3W	[illegible]	0	100
132S–14	Pair/3W	[illegible]	0	70
499B–1	Pair/OC	[illegible]	0	0
499B–2	Pair/OC	92	0	0
387E–1	Pair/3W	[illegible]	0	71
387E–2	Pair/3W	[illegible]	32	[illegible]

Pass/Fail Analysis for the Lotus 2.2 L Engine

Lotus did not submit any emissions data for the 2.2 L engine and is therefore considered to be a no data case for both 1981 and 1982.

Pass/Fail Analysis for the Lotus 2.2 L Turbocharged Engine

The 2.2 L turbocharged engine is also considered to be a no data case for both 1981 and 1982 because Lotus failed to submit emissions data for this engine.

Toyota

Toyota has submitted their second CO waiver application for the 108 CID engine. Toyota's previous waiver request for this engine was denied in the CO Waiver Decision of September 5, 1979 due to insufficient data.

Toyota has two emission control systems designed to meet the 1981–1982 standards, which they categorize as systems "A" and "B". A third system was used for 1980 California certification. These systems are as follows:

System A (1981–1982)	CL–AIR/OSC/3W/EGR.
System B (1981–1982)	CL–AIR/3W/EGR.
1980 System	CL–AIR/OC/EGR.

Toyota characterized system A as their design "to meet the 3.4 CO standard without particular regard to cost, available space . . . or other possible negative factors . . ." [2 at 1–5]. System B represents a preliminary, cost effective approach to meeting the 1981–1982 standards. Toyota stated that "despite our strong expectations for these system B emission controls, prototype testing proved them inadequate in each case . . ." [2 at 1–5]. Toyota stated that if a CO waiver is granted they would use system B [2 at 5–2].

Pass/Fail Analysis for the Toyota 108 CID Engine Family

Toyota provided durability data on six vehicles that were acceptable for the Monte Carlo analysis (see Table V–7). The EPA technical staff also included vehicle 80–CD–1, which is a 1980 California certification durability vehicle.

Vehicle 80–CD–1 was equipped with AIR/OC/EGR and its certification results were as follows:

Miles	HC	CO	NO_x	MPGu
4793	0.146	2.02	[illegible]	13.11
9803	0.181	3.39	0.79	23.97
15019	0.175	[illegible]	[illegible]	[illegible]
15038	0.196	[illegible]	[illegible]	[illegible]
20192	0.224	[illegible]	0.90	23.97
25193	0.196	2.72	[illegible]	[illegible]
30016	0.194	[illegible]	[illegible]	[illegible]
30036	0.227	2.55	[illegible]	[illegible]
35192	[illegible]	2.79	0.81	24.22
40192	0.222	[illegible]	[illegible]	[illegible]
45159	[illegible]	2.37	[illegible]	[illegible]
45178	[illegible]	3.07	0.81	23.18
49856	0.191	3.27	[illegible]	23.29
4,000 (extrapolated)	0.175	2.64	[illegible]	23.75
50,000 (extrapolated)	[illegible]	[illegible]	[illegible]	[illegible]

This vehicle has already certified at emission levels below the 1981–1982 standards.

Vehicles in Toyota Waiver Application

Engine and VIN	Emission control system	Entered in Monte Carlo	If not entered in Monte Carlo, why?	References
108, TE31–42	EM/AIR/EGR/OC/RM	No	Not current control system	1 at A–5–1.
108, 177B–16	EM/AIR/EGR/OC/RM	No	Not current control system	1 at A–5–2.
108, 353B–4	EM/AIR/EGR/OC/RM	No	Insufficient data	1 at A–5–3.
108, 215B–8	EM/AIR/EGR/OC/RM	No	Insufficient data	1 at A–5–4.
108, 130B–24	EM/AIR/EGR/OC/RM	No	Not current control system	1 at A–5–5.
108, 353B–46–1	EM/AIR/EGR/OC	No	Insufficient data	1 at A–5–6.
108, TE66–15–1	EM/AIR/EGR/OC	No	Insufficient data	1 at A–5–7.
108, 353B–40–1	EM/CL–AIR/EGR/3W	Yes		1 at A–5–8.
108, TE51–60	CL–AIR/EGR/3W	Yes		1 at A–5–9.
108, 231B–21–1	CL–AIR/EGR/3W	No	Insufficient data	1 at A–5–10.
108, 353B–40–2	CL–AIR/EGR/OSC/3W	Yes		1 at A–5–11.
108, 353B–46–2	CL–AIR/EGR/OSC/3W	Yes		1 at A–5–12.
108, TE51–50	CL–AIR/EGR/OSC/3W	Yes		1 at A–5–13.
108, TE66–15–2	CL–AIR/EGR/OSC/3W	No	Insufficient data	1 at A–5–14.
108, 235B–5	CL–AIR/EGR/3W	Yes		1 at A–5–15.
108, 80–CD–1 [1]	AIR/OC/EGR	Yes		1980 certification data.

EM—abbreviation for engine modification.
RM—abbreviation for reactive manifold.
OSC—abbreviation for oxidation start catalyst.
CL–AIR—abbreviation for a closed loop AIR system.
[1] Not included in waiver application.

Toyota presented the following assertions to show that vehicle 80–CD–1, which was equipped with a manual five speed transmission, did not demonstrate Toyota's technical ability to meet the 1981–1982 standards:

"The certification data of the 1980 model California emission data vehicles are shown in Table 4.

Table 4

Vehicle	Transmission	HC (g/mile)	CO (g/mile)	NO_x (g/mile)	F/E (mile/gallon)
CE–1	5M/T	0.180	2.66	[illegible]	23.1
CE–2	3A/T	0.207	4.40	0.61	23.0
CE–3	3A/T	0.240	5.95	10.77	[illegible]
CE–4	4M/T	0.169	2.44	[illegible]	[illegible]

We have not tried to test the 80–CD–1 type system in combination with a start catalyst or sweep-up catalyst and therefore, cannot give a precise answer. Although, it can be stated that a manual transmission vehicle with a start catalyst may be able to meet the 3.4 g/mile CO emission standard, it would not meet our development target. On the other hand, since the CO emission level of the automatic transmission vehicle is the same as the 1981 system B, then even if we adopt a start catalyst, it will be far from our development target of 2.3 g/mile of CO. A/T is necessary to satisfy our basic market demands" [7 at 9].

The EPA technical staff rejects Toyota's assertions concerning the 1980 California durability vehicle (80–CD–1) and the emission data vehicles CE–1, CE–2, CE–3, and CE–4 for the following reasons:

(1) The Monte Carlo simulation, rather than Toyota's emissions targets, is the critierion by which technical feasibility is determined. Table V–8 lists the Monte Carlo results of the vehicles entered. As shown, vehicle 80–CD–1 passes the analysis with a hardware improvement factor for a start catalyst. Also, without the start catalyst factor, 80–CD–1 passes HC and NO_x, and fails CO with a probability of 79%. This indicates that Toyota is very close to passing even without a start catalyst.

Table V–8.—*Monte Carlo Results of Toyota Vehicles Using the 108 CID Engine*

VIN	Control system	Probability of pass			Comments
		HC	CO	NO_x	
TE51–50	A	74	0	[illegible]	
TE51–60	B	80	0	100	
235B–5	B	[illegible]	0	100	
353–40–1	B	100	15	87	
353–40–2	A	97	5	100	
353–46–2	A	75	0	71	
80–CD–1	AIR/OC/EGR	100	79	[illegible]	
80–CD–1	AIR/OC/EGR	100	97	88	(1)

[1] Factors for a start oxidation catalyst.

(2) Toyota's assertion that "since the CO level of the automatic transmission vehicle is the same as the 1981 system B, then even if we adopt a start catalyst, it will be far from our development farget of 2.3 g/mile of CO" [7 at 9] was not substantiated given that in a prior statement Toyota said that "We have not tried to test the 80–CD–1 type system in combination with a start catalyst * * *" [7 at 9].

(3) The "certification data" Toyota included in Table 4 failed to include the confirmatory test data on which 1980 California certification of the 3T–C family was based. For example, Vehicle CE–3, equipped with an automatic transmission, achieved a CO level of 3.27 g/mi on the EPA confirmatory test, yet Toyota only reported the result from an earlier test with a CO result of 5.95 g/mi. In another example, Toyota submitted a test result of 2.44 g/mi CO on vehicle CE–4 but failed to include the confirmatory test result of 1.82 g/mi CO, which was the test for CE–4 on which certification was based.

These disparities are tabulated in Table V–9 and are misleading in that the automatic transmission vehicle, CE–3, is presented as having CO emissions over 80% higher than was actually the case with confirmatory testing. Toyota alluded that the results of vehicle 80–CD–1 should not be used to determine technical feasibility "since the CO emission level of the automatic transmission vehicle is the same as the 1981 system B, then even if we adopt a start catalyst, it will be far from our development target of 2.3 g/mile of CO. A/T is necessary to satisfy our basic market demands" [7 at 9]. Yet the "certification data" Toyota submitted to support this contention had been superceded by the confirmatory tests which Toyota failed to submit. As discussed at the hearings, Toyota also failed to include the data from vehicle 80–CD–1, which completed mileage accumulation with emissions below the 1981–1982 standards. The official test results listed in Table V–3 were performed on or before July 18, 1979. The Toyota waiver application is dated September 24, 1979.

Table V–9.—*Data Submitted by Toyota Versus Official Data on Which Certificate of Conformity Was Issued*

Vehicle and transmission	Official	Toyota
	HC	
CE–1, 5–MT	[illegible]	0.180
CE–2*, 3–AT	0.207	0.207
CE–3, 4–AT	0.159	[illegible]
CE–4, 4–MT	0.139	[illegible]
	CO	
CE–1, 5–MT	3.02	[illegible]
CE–2,* 3–AT	4.40	4.40
CE–3, 3–AT	3.27	5.95
CE–4, 4–MT	1.82	2.44
	NO_x	
CE–1, 5–MT	[illegible]	[illegible]
CE–2,* 3–AT	0.61	0.61
CE–3, 3–AT	[illegible]	0.77
CE–4, 4–MT	[illegible]	[illegible]

*No confirmatory tests performed at EPA.

"The Guidelines for Applications for Waiver of the 1981 Carbon Monoxide Emission Standard" state that, in Section 5; "the manufacturer should provide all the information regarding the availability of effective control technology. All the information and data requested in this section should *include and emphasize data regarding that configuration of the model, for which a waiver is requested, having the greatest likelihood of meeting the 3.4 gram-per-mile CO standard.* The information requested in this section, if provided with sufficient support material and in sufficient detail, will be considered by the Administrator to be the *minimum required of the applicant to establish his inability to comply with the standards."* [emphasis added] [9 at 47276]

Not only did Toyota fail to emphasize data on a configuration with the greatest likelihood of meeting the 3.4 CO standard, they failed to supply *any* data on vehicles using the 1980 oxidation catalyst system, which has already certified to the 1981–1982 standards.

(4) The vehicles in Table V–9 certified to a 1980 California CO standard of 9.0 g/mi and can be expected to show improved emissions when calibrated to meet a 3.4 g/mi CO standard.

The Monte Carlo results listed in Table V–8 show that the vehicles with systems A and B are not predicted to pass. Vehicle 80–CD–1 is predicted to pass with a hardware improvement factor for an oxidation start catalyst.

Because Vehicle 80–CD–1 has already completed its mileage accumulation for certification below the 1981–1982 standards, a Monte Carlo simulation is unnecessary. Based on the results of vehicle 80–cd–1, the 108 CID engine passes without hardware improvement factors. With a start catalyst factor the Monte Carlo results confirm Toyota's ability to certify the 108 CID engine Federally in 1981.

VI. Cost Analysis

EPA Cost Estimates

The costing methodology used here is essentially the same as that used in the two previous CO waiver decisions [4], [11 at 53400], [21 at 69450]. Additional responses to the EPA subpoena of August 8, 1979 enabled EPA to further revise cost estimates of certain emission control devices, notably monolithic three-way and oxidation catalysts. The subpoena requested prices that suppliers charge the automobile manufacturers for emission control devices or systems.

Table VI–1 presents EPA estimates of cost to the consumer of compliance with 3.4 vs 7.0 CO (due to lead time problems for certain emission control devices, separate estimates are necessary for 1981 and 1982). The changes in cost were calculated by individual engine size. These changes were based on the differences in emission control hardware between a) systems targeted to meet 7.0 CO, as described by each manufacturer in their applications and b) systems judged capable by EPA of meeting 3.4 CO, based on Monte Carlo results or successful 1980 certification of similar vehicles. Cars which passed Monte Carlo often needed improved emission control hardware to do so, and these technological improvements were all costed in.

As shown in Table VI–1, EPA did not find an increase in cost for every engine size which passed the .41 HC, 3.4 CO, 1.0 NO_x emission standard in the Monte Carlo analysis. (For example, certain Monte Carlo factors implied no change or a decrease in cost.) Engine sizes which are labeled "no data" or "fail" in the Monte Carlo analysis are automatically assumed to have no change in cost.

The range in cost for AM is basically attributable to the difference between the 1980 and 1981 C–4 electronics. AM could conceivably certify to 3.4 CO with either system in 1982.

Table VI–1.—*EPA Estimate—Cost of Compliance With 3.4 CO*

Manufacturer	CID	3.4 vs 7.0 CO in 1979 dollars	
		1981	1982
AM	151	0 (fail)	108–146.
GM	231 (3.8L) 4V Turbo.	0 (fail)	(No date).
Lotus	122 (2.0L)	0 (fail)	0 (no data).
	134 (2.2L)	0 (no data)	0 (no data).
	134 (2.2L) Turbo.	0 (no data)	0 (no data).
Toyota	108	−16*	−16*

*Includes the addition of an oxidizing start catalyst.

Manufacturers' Cost Estimates

Table VI–2 presents the manufacturers' estimates of cost to the consumer of compliance with the 3.4 CO standard over cost of meeting 7.0 CO [16 at Vol. I, Sec. V, p. D–2] [10 at A–6] [17 at 10] [5 at 10] [2 at 5–2]. Most manufacturers claimed some degree of confidentiality for their cost estimates, therefore, this table contains only that information which can be released. A cost of "0" dollars signifies that the manufacturer did not specify different control systems to meet 3.4 CO and 7.0 CO.

Table VI–2.—*Manufacturers' Cost Estimates*

Manufacturer	Cost of compliance—3.4 CO v. 7.0 CO
AM	Confidential
GM	0
Lotus	$1000
Toyota	$95–$140

VII. Driveability

American Motors

The issue of driveability is of little importance in the determination of American Motors' ability to comply with the 1981 CO emission standard of 3.4 g/mile. No quantitative driveability data were included in any of their submissions regarding a waiver request for the 151 in³ engine family.

The only mention made of vehicle driveability was in American Motors contention that since their emission control systems are purchased from General Motors, they have lead time problems packaging these systems in their vehicles with adequate driveability [5 at 97]. AM says they will go with GM's second generation C–4 system to meet the 3.4 g/mile CO standard, or the first generation (1980 California) system if granted a waiver [5 at 170].

The representative from AM discussed driveability difficulties with their 1980 Federal systems, which were also purchased from GM.

"First of all, out 1980 application to passenger cars has been a rather unsuccessful application. We have two configurations of passenger cars certified for 49 state applications, both of which have outstanding running changes. The driveability of those packages in our vehicles is less than acceptable to our standard. So we are in the process of processing running changes to correct the immediate problems associated with those two calibrations." [5 at 18]

With regard to meeting the 3.4 CO standard, AM claims to need 16 months lead time to apply the second generation C–4 system. They say that a large portion of this lead time must be devoted to driveability testing. [5 at 127].

The absence of driveability data or even an appreciably rigorous testing procedure make it difficult for the EPA staff to assess the magnitude of AMC's alleged difficulties.

General Motors

Driveability was not raised as an issue in the determination of General Motors ability to meet the 1981 CO emission standard of 3.4 g/mile. No quantitative driveability data or even subjective commentary were included in any of their submissions regarding a waiver sought for the 3.8L turbocharged engine family. Driveability, therefore, will *not* be a crucial criterion in the decision for waiver of this engine family.

Lotus

No driveability data were submitted by Lotus Cars Ltd. in their application for CO waivers at the public hearing, or in their supplemental information. There were, however, occasional subjective driveability comments made in discussions of the development programs for exhaust gas recirculation, use of additional catalysts, electronic fuel injection, closed loop carburetion and turbochargers. No objective rating scheme or driveability test procedures were provided.

With regard to the EGR "system 5" with a variable vacuum regulator it was stated that "subjective driveability problems also existed in hard accelerations with this system although these were not quantified" [6 at section 1].

In their original application Lotus asserted, though they did not support their claims with data, that the addition of a second (oxidation) catalyst to their system would cause performance penalties associated with (a) the increased exhaust backpressure, (b) the extra weight of the additional catalyst, an air pump and the associated air management controls and (c) the horsepower absorbed by the air pump [3 at 5]. In their supplementary application, Lotus submitted emission data on vehicle 132S with an additional catalyst and an air pump [6 at 2.2.3], but stated . . .

"Our usual quantitative driveability test (measuring acceleration times) was not attempted because the car was so obviously slow." [6 at section 2]

The car was slow particularly during the cold phase. The driving trace could not be followed even under conditions of wide open throttle. However, the measurement of acceleration times is generally not considered a test of driveability. Driveability is usually assessed in terms of surge, hesitation, backfire, stall, startability, idle quality, run on, afterfire and similar phenomena. Evaluations such as acceleration times and power losses are usually measures of vehicle performance.

Tony Rudd, Corporate Research Director of Lotus Cars of England, mentioned a 6 to 8 horsepower performance penalty associated with the dual bed (three-way plus oxidation) catalyst alternative at the public hearing, but failed to submit the accompanying performance data [5 at 16–17].

Lotus is currently developing alternative technology for new engines aimed at improved economy and performance. They stated that . . .

". . . the design improvements due to be incorporated in the V8 engine will give further improved performance and economy. It is expected that with careful combustion control and digital fuel injection, emissions levels will be within 1982 statutory limits." [6 at section 6]

Another alternative, to be ready for use in 1980 (and 1981 if a waiver is granted), is the turborcharged engine. Lotus suggests that this engine will not meet the 1981 emission standards, but it feels it is a cost effective solution to satisfy customer demands for economy and performance until the new engines become available [6 at section 5].

As a bottom line to this discussion, Lotus declares that they cannot feasibly assess driveability because their present technology does not allow them a comparison:

"Since we have not achieved the 1981/82 statutory limits, we have no data available to accurately assess the effect on fuel economy and driveability of complying with these limits." [6 at section 4]

Toyota

Toyota has stated that the basic difference between their A and B systems with regard to engine family 3T–C is the addition of a monolithic oxidizing start catalyst to system A [5 at 54]. Systems A and B are targeted for the 3.4 and 7.0 g/mile CO standards, respectively. Driveability as assessed by Toyota is better with system A than system B, slightly superior under cold conditions and greatly improved under warmed-up conditions. This assessment is based on only one test vehicle, vehicle 230B–18, and the same vehicle was used for testing both the A and B systems [2 at 5–4]. No vehicle description for 230B–18 could be found in any of the documents provided by Toyota.

It is important to note that based on Toyota's criteria for acceptable driveability, system B is rated marginally unacceptable for the cold start and acceptable in the warmed-up portion of the test. System A meets the acceptable rating for both portions of the test [2 at 5–4]. Toyota concludes that based on this vehicle, system A has "good" driveability and system B has "adequate" driveability [2 at 5–5]. It is the opinion of the EPA technical staff that Toyota has shown better driveability on their 3T–C engine with a start catalyst than without one.

Toyota's 1980 certification vehicle, 80–CD–1, has passed the Monte Carlo simulation model with a start catalyst. However, no driveability data were submitted for vehicles using this type of emission control system.

VIII. Fuel Economy

Of the four applicants in this round of CO Waiver hearings, two manufacturers claimed a fuel economy loss would be incurred if their waiver applications were denied. Those manufacturers were Toyota and Lotus. Of the remaining manufacturers, General Motors did not address the subject of suffering a fuel economy penalty in order to meet 3.4 CO, and AM did not claim a fuel economy loss in meeting 3.4 CO but did indicate that if their waiver request was denied, then their inability to market vehicles with these smaller engines would result in a loss in Corporate Average Fuel Ecomomy (CAFE).

Toyota

Toyota claimed that their 1981 system has the potential of increasing fuel economy from 5 to 20% over 1980 production vehicles [7 at 10 and 5 at 48], if the CO standard were waived to 7.0 g/mi. If the waiver were denied, Toyota claims they would need an additional oxidation catalyst added to the 1981 system which would result in a 2 to 3% fuel economy loss due to the additional backpressure of the catalyst [5 at 47]. However, as seen from the data in table VIII–1, the data supplied by Toyota do not support their claim. The fuel economy of Toyota's system A, for which Toyota is claiming a 5% loss due to an increase in backpressure, appears to show a fuel economy increase of 0.2 MPG compared to their system B, when the respective data are averaged. It is also interesting to note that vehicle #80–CD–1, which is a 1980 California certification vehicle, passed the emission levels of 0.41

HC, 3.4 CO and 1.0 NO_x. The 1980 California system passed these standards with a fuel economy of 23.8 MPGu when averaged throughout its durability. Since composite fuel economy has historically been over ten percent higher than urban fuel economy, vehicles using this engine will surely exceed the 1982 CAFE standard of 24 MPG.

Therefore Toyota has already exhibited that they have in their possession sufficient technology to meet CAFE as well as the emission standards simultaneously for both 1981 and 1982 for this engine family.

Table VIII-I.—*Toyota Fuel Economy Data*

	Exhaust system	Inertia weight	Engine displacement	Transmission	Axle ratio	Ave. durability F.E. (MPGu)	No. of data pts.
Vehicle I.D.:							
353B-40-2	A	2,500	108	A3	3.909	24.2	8
353B-46-2	A	2,500	108	M5	3.727	24.5	10
TE51-50	A	2,500	108	M5	3.727	24.4	5
TE66-15-2	A	2,625	108	M5	3.727	25.7	4
353B-40-1	B	2,500	108	A3	3.909	24.3	7
TE51-60	B	2,500	108	M5	3.727	24.5	8
231B-21-1	B	2,500	108	M4	3.727	23.6	7
235B-5	B	2,500	108	A3	3.909	25.5	6
[1] 80-CD-1	OC/Air/EGR	2,500	108	M5	3.73	23.8	13

[1] 1980 California certification data.
A=AI+OC+CL-3W.
B=AI+CL-3W.

Lotus

Lotus is apparently planning to use their 1980 California system in the '81 and '82 model years. This system has passed in 1980 Certification below the levels of 0.41 HC, 7.0 CO and 1.0 NO_x with fuel economy marginally above the 1980 CAFE standard. However, Lotus' attempts at improving this system have been somewhat limited since apparently they feel that they do not have a large enough portion of the U.S. market to justify such an expense. Lotus did report, however, that adding an additional oxidation catalyst to their 1980 California system, consisting of an open loop 3-way catalyst with air injection, results in a fuel economy loss of 2 MPG [5 at 12]. Lotus did not supply data to verify this claim, but it does appear to be a high estimate of the loss due to the additional backpressure. If Lotus does use the 1980 California system for 1981 and 1982, it appears doubtful that the fuel economy increase to the CAFE standards of 22 and 24 MPG respectively can be obtained without some type of hardware change. It seems that Lotus' fuel economy problems stem from insufficient technology (i.e. lack of feedback fuel control) and not due to the difference between the 3.4 and 7.0 CO standards, since Lotus' fuel economy would be below CAFE standards with this system. Lotus also reported that they plan to have EFI available to them by 1983 and expect an improvement such that they may be able to achieve 30 MPG_c with this system [5 at 8].

General Motors Corp. (GM)

GM did not address the subject of a fuel economy penalty resulting from meeting the 3.4 CO standard. Since this issue was not presented, it may then be interpreted that fuel economy is not an issue for GM in meeting 3.4 CO with vehicles using the 231 turbocharged engines. Thus it appears that GM has not changed its position from their earlier testimony.

American Motors Corp. (AM)

AM claimed that if their waiver request were denied, they would be left in a position where they would have no 4 cylinder engines to market. If this were in fact the case, AM claims they would be unable to meet the CAFE standard of 22 MPG_c for 1981. Therefore AM claims that they need this waiver such that the 4 cylinder engines can boost their CAFE fleet to an acceptable level [5 at 133].

Summary

As in the past CO hearings, none of the manufacturers who claimed a fuel economy penalty between 3.4 and 7.0 g/mi. CO provided substantiating data to confirm their claim. Also, as in past hearings, those manufacturers failed to submit fuel economy data at the levels of 0.41 HC, 3.4 CO, and 1.0 NO_x. The absence of such data tends to imply that the fuel economy penalties are due to differences in systems and not necessarily related to the differences in CO standard. The opinion of the EPA technical staff, after reviewing each manufacturers' respective data, remains unchanged; that a reduction in CO from 7.0 to 3.4 g/mi does not result in an inherent fuel economy penalty.

IX. Lead Time Considerations

American Motors (AM)

AM currently has certified their 1980 California versions of vehicles using the 151 CID engine from General Motors. The primary emission control components of that system include a feedback carburetor, ported EGR, a pelleted 3-way catalyst, and the first generation electronic control unit (ECU) [5 at 90–92]. These are the same components used by GM, though production calibrations are not identical [5 at 90, 98 and 150 to 152].

The primary emission control components of the 1981 GM system include a feedback carburetor, backpressure EGR, switched air injection (AIR), electronic spark advance (ESA), a monolithic 3-way catalyst, a monolithic oxidation catalyst, and the second generation ECU [5 at 81 to 92]. This is substantially different than the 1980 California system by the addition of ESA, AIR, and a clean up oxidation catalyst. Other differences do exist, but probably are not as important as those already mentioned.

AM already has received a waiver from 1.0 to 2.0 NO_x for the 1981 and 1982 model years. Due to the situation, a waiver to 7.0 CO would allow AM to carry over either their 1980 Federal or California emission control systems for Federal use in both the 1981 and 1982 model years. Since both are currently certified by EPA, no additional development or certification efforts would be required.

The original AM waiver request indicated that the 1980 California system would be used if a waiver were received [13 at 7]. The second AM waiver request said that AM would utilize the 1981 Federal GM system (the same one GM will use without a waiver) if they were to receive a waiver [12 at 4 to 6]. A new system with both warmup and main catalysts would be a back up system [12 at 8 to 10]. In their most recent submission, AM has stated they will use the 1980 California system at 7.0 CO [20 at 1]. This confusion in the AM situation was apparently generated when GM temporarily decided that they could not provide the 1980 California system to AM. This decision by GM was later reversed [12 at 4 to 6 and 5 at 149].

The contract, under which GM provides the 151 CID engine and emission control system to AM, allows AM to use the deterioration factors generated by Pontiac certification vehicles. The contract does not preclude AM from entering additional engine families into the certification process at their own expense. This is apparently the path which has been been chosen by AM in selecting their back up family using an oxidation catalyst system [12 at 8 to 10].

It should be noted that the 1981 back up oxidation catalyst family will probably not be considered by AM at 7.0 CO now that the 1980 California system is available.

The emission control system which would be used by AM if a CO waiver is not received is the same as the 1981 Federal system being used by GM (called the C–4 system by GM). AM has stated that they will be unable to certify vehicles using the 151 CID engine in 1981 without a waiver due to lead time problems in learning to utilize the second generation system [12 at 11 and 5 at 126 to 135]. They stated that "we believe it is unreasonable and inconsistent with the intent of Congress and contrary to the technical reality to expect a vendor-dependent company such as American Motors to possess the necessary advanced emission control technology in the same model year other manufacturers are introducing it for the first time" [12 at 10].

AM believes that they cannot complete the certification of the system for 1981 because ". . . the [C–4] system has such a wide range of capabilities that we are overwhelmed with more flexibility than we can reasonably contain with our in manpower/facilities/time constraints [12 at 6]".

Key dates in the evaluation of the C–4 system at AM have been stated by GM and AM as follows:

Date	Event	Reference
February 1979	1. AM received components from GM that were used to "derive" current emission components.	5 at 138–139.
April 1979	2. AM received the second generation ECU	5 at 139.
May 1979	3. AM received the Pontiac "declaration of their prime package".	5 at 99.
Late August to early September 1979.	4. AM had assembled vehicles with the C–4 system in "usable, functional hardware, short of calibration".	5 at 99.
May 1980	5. AM estimates GM will have 4,000 mile vehicle calibrations developed—AM can then start to develop final calibrations.	5 at 98.
August 1980	6. AM estimates (with high risk) that they can certify the C–4 system to 7.0 CO.	5 at 129.
	7. AM estimates (with much less risk than above) it takes 16 months from August 1980 to certify to 3.4 CO with the C–4 system.	5 at 126–135.

There are several important things to discuss in this group of events which operates against AM's assertion that they need a two year waiver to provide adequate lead time to meet 3.4 CO. First, there was a substantial delay between the time when AM received components from GM and the time AM had a vehicle which was operational. This apparently was due to AM's emphasis on completing their 1980 California certification. The California certification was completed in October, 1979 and was not in time for AM's scheduled start of production in July, 1979 [12 at 11].

Second, AM has claimed that their final calibration efforts can not commence until GM has completed the calibration development for their emission data vehicles. This is peculiar in that AM extensively discussed, (1) the differences between the GM vehicles and the AM vehicles [5 at 107 to 109], (2) the historical differences in final calibration of the GM and AM vehicles [5 at 98 to 102], and (3) the AM responsibilities for the final vehicle calibration [5 at 97 to 99].

Third, it is peculiar that AM would even consider expending their limited efforts on the C–4 system for certification at a 7.0 level (at the time of their submission AM believed that the 1980 California system would not be available) as their 1980 Federal vehicles would already comply with the 0.41 HC, 7.0 CO, 2.0 NO_x standard.

Finally, the AM estimate of the need for a 16 month lead time (from August of 1980) to meet 3.4 CO seems extremely long. AM was asked to provide information supporting this estimate and the method used to obtain this estimate. The AM response is contained in reference 20. In the opinion of the technical staff, the need for sixteen months lead time was not substantiated by the AM submission.

On the more optimistic side, AM has several advantages that most other vehicle manufacturers do not have. First is their 2.0 NO_x standard in 1981 and 1982. This is the result of special legislation contained in section 202(b)(1)(B) of the 1977 Amendments to the Clean Air Act. Second, they have received the benefits of the GM/AM agreement. AM receives emissions control hardware and technical advice from GM. The advice from GM includes assistance in the calibration of AM vehicles [5 at 151]. Also AM stated that it is their current desire to introduce the second generation system in 1981 in California [12 at 8].

Nevertheless according to the most recent AM submission substantial difficulties are still being encountered with the second generation C–4 emission control system. As examples, AM is still having problems with the wiring of the C–4 system. Not a single vehicle is running properly as of December, 1979. And some emission control hardware is still being "cobbled" [20 at 4 to 5].

In view of the lack of progress at AM since the Administrator's initial decision for this engine the current AM problems discussed in the paragraph above, and the continuing lack of any emission data from AM on this engine, it is now the opinion of the technical staff that AM no longer has sufficient lead time to complete development and acceptable calibration of vehicles using the 151 CID engine for Federal use in 1981.

AM was not really sure that a waiver would be needed in the 1982 model year [5 at 125] and indicated that there was still a possibility of achieving 3.4 CO in 1981 with the second generation system. The latter possibility was considered to be "highly unlikely" by AM however [5 at 134 to 135]. With a waiver in 1981, AM will no longer need to expend effort on the calibration and certification of the second generation system for 0.41 HC, 7.0 CO, 2.0 NO_x. The effort saved here should enable AM to introduce the second generation system as planned in California in 1981. Assuming that AM makes a good faith effort to develop and calibrate the second generation C–4 system in 1981 for Federal use, they should have completely adequate lead time for successful federal certification in 1982.

General Motors

General Motors did not make much of an issue of lead time in their application for waiver of the 3.4 g/mile CO standard for the 3.8L turbocharged V–6 engine family. GM claims that the added thermal mass of the turbocharger slows warm-up of the system and delays light-off of the catalytic converter. Therefore, they say that the standard will be difficult to meet in the available time frame [5 at 156]. No evidence was presented, however, to show that this system could eventually meet the standard (in 1983), though GM expects to observe substantial improvements with their dual-bed C–4 technology [5 at 156].

GM would like the field experience with the turbocharger and with their spark knock limiter system. The turbo, they claim, will provide them with a small displacement engine with the power of a larger engine while maintaining many of the benefits of a smaller engine [5 at 154]. It is not evident to the EPA staff however, that it will take GM two additional years of field experience to achieve the 3.4 CO standard with this engine.

From the information submitted so far by GM, it appears that the 3.8L turbocharged engine will not meet the 3.4 g/mile CO standard by 1981 with the systems they have tested. Systems with which they have not really experimented, which might help them meet the standard, were discussed at the public hearing. These included warm-up catalysts, increased catalyst volumes and use of exhaust port liners.

GM did not test warm-up converters, but said that the available evidence indicated very high deterioration factors when warm-up converters were used [5 at 157]. They also did not consider placing a start catalyst or the three-way portion of a dual-bed system before the turbocharger where the exhaust is hotter. This, they explained, was an effort to keep the restriction level between the engine and the turbo as low as possible to conserve the heat for boosting the turbo as quickly as possible [5 at 158].

In a follow-up submission, GM showed data comparing a highly loaded 250 in^3 dual-bed pelleted converter, a 170 in^3 dual-bed monolithic converter and a 130 in^3 dual-bed pelleted converter. Due to the poor warm-up efficiency of 250 in^3 pelleted converter and the emission results and increased exhaust

backpressure of the 130 in^3 pelleted converter, they selected the 170 in^3 dual-bed monolithic converter as their first choice system for this engine family [19 at 6–7]. The possibility of using a larger volume monolithic converter was not mentioned by GM.

No testing was done on exhaust port liners. GM explained that their engine has a fairly short exhaust port from the valve to the flange and they are concentrating their effort on providing a lower mass exhaust manifold [5 at 162].

In the opinion of the EPA technical staff the use of start catalysts, larger monolithic catalysts, and port liners would improve the emissions from this engine and could be developed for this engine in time for use in 1982 model year certification.

Lotus

An issue with which Lotus cars claims to have lead time difficulties is their development of electronic fuel injection. At the public hearing of November 5, 1979 the representative from Lotus stated . . .

"We do believe that we could meet the standard with the use of electronic fuel injection with a yet undeveloped system of measuring air flow control. We are actively pursuing development of this system to use on the new range of engines [5 at 9]."

In their supplementary submission, Lotus included a letter from the Lucas Company, their prime fuel injection program subcontractor, which contains a schedule of their program and a job one date of June 1981. Lotus noted that the job one date may be delayed three months due to industrial unrest in the United Kingdom, making September 1981 the start of production [5 at 33]. This means that Lotus could definitely use fuel injection technology on their 1982 model year vehicles.

In the letter, Lucas states that the objective of the program is . . .

"To apply Lucas digital electronic fuel injection to a new V8 Lotus engine for both Federal and European vehicle applications. The program is based on the 1982 model year and an annual production rate of 1000 engines [6 at section 6]."

Lotus is therefore placing initial emphasis on the development of electronic fuel injection for their new V8 engine rather than for the in-line four cylinder engines which are the subject of their current waiver application.

It appears logical that the development of fuel injection for a new V8 engine would take considerably more effort and lead time than a similar development program for the in-line four cylinder engines.

In other words, Lotus has sufficient lead time to apply electronic fuel injection to the engines for which a waiver is currently being sought by the 1982 model year.

Toyota

Lead time does not appear to be an issue with Toyota in their request for a waiver of the 1981–82 emission standards for engine family 3T–C. The only mention made of insufficient lead time was to accomodate their vehicles with a clean up oxidation catalyst [7 at 2]. Toyota has stated that they do not feel the clean up catalyst will assist them in meeting the emissions standards and that there is no room for it in their vehicles anyway [7 at 2]. They seem more concerned with meeting the fuel economy standards and having good driveability since the emissions requirements have already been met with their 1980 certification vehicle 80–CD–1 [5 at 67]. At the public hearing, it was confirmed that vehicles using the same emission control system as vehicle 80–CD–1 could be available for sale in the United States for model year 1981 [5 at 64]. Toyota prefers a system with an oxidizing catalyst and has more experience with it.

"The system with start catalyst has a great advantage for non-FTP emissions, especially for cold temperature conditions not under consideration." [7 at 2]

Use of oxidizing start catalysts on the 3T–C engine family is definitely not a question of lead time or availability since they have already been tested and used on development vehicles for system A.

It appears entirely possible then, that Toyota could produce a system like the one that passed 1980 certification with the addition of an oxidizing start catalyst to be used in time for the 1981 model year. This system has been evaluated, run and passed the EPA Monte Carlo simulation model. The system very nearly passed without the aid of a start catalyst so Toyota should have little difficulty meeting the emissions and fuel economy standards in 1981–82 with a start catalyst on their 3T–C engine.

X. References

1. Toyota Motor Co., Ltd. *Request For Waiver Carbon Monoxide Standard Applicable to 1981 and 1982 Light Duty Vehicles,* June 1979.

2. *Toyota CO Waiver Application Supplementary Materials,* September 24, 1979.

3. *Lotus 1981/82 CO Standard Waiver Application.*

4. Leroy H. Lindgren, *Cost Estimations For Emission Control Related Component-Systems and Cost Methodology Description,* EPA Pub. #460/3–78–002, March 1978.

5. *Transcript of Proceedings—United States Environmental Protection Agency—In the Matter of: Applications For Waiver of 1981 Model Carbon Monoxide Emission Standards,* Acme Reporting Company, November 5, 1979.

6. *Lotus Cars Limited, CO Waiver Application Supplementary Information,* November 16, 1979.

7. Letter and Enclosures to Mr. Charles Freed (Manufacturers Operations Division of EPA) from Mr. J. Kawano (Toyota Motor Co., LTD.), November 20, 1979.

8. Letter and enclosures to Mr. Benjamin R. Jackson (Mobile Source and Noise Enforcement Division of EPA) from Mr. S. L. Terry (Chrysler Corporation), Nov. 19, 1979.

9. **Federal Register,** Vol. 43, No. 199; Friday, October 13, 1978.

10. Chrysler Corporation, *Petition For Reconsideration Of EPA's Decision Denying 1981–82 Model Year CO Waiver,* October 16, 1979.

11. **Federal Register,** Vol. 44, No. 179, September 13, 1979.

12. *American Motors Corporation petition for Reconsideration of a Waiver of the 1981 Carbon Monoxide Emission Standard for AM's 151 CID Engine Family,* October 28, 1979.

13. *American Motors Corporation Application For Waiver of the 1981 and 1982 Carbon Monoxide Emission Standard,* July 3, 1979.

14. *General Motors Documents Submitted in Response to EPA Subpoena Dated October 31, 1979, Re: American Motors Corporation CO Waiver Application for the 151 CID Pontiac Engine,* Submitted to Environmental Protection Agency; November 5, 1979.

15. *American Metal Market/Metalworking News,* Dec. 3, 1979.

16. *CO Waiver Application, Chrysler Corporation, Application for Waiver of the 1981–82 Model Year Carbon Monoxide (CO) Standard of 3.4 grams Per Vehicle Mile for Passenger Cars,* July 3, 1979.

17. *General Motors Application For Waiver of 1981 and 1982 Carbon Monoxide Emission Standard (Turbocharged 3.8 Liter Engine Family),* November 2, 1979.

18. Engelhard Industries, July 9, 1979, *Response to the Environmental Protection Agency Subpoena* dated June 29, 1978.

19. Letter to Mr. Charles N. Freed (Manufacturers Operations Division of EPA) from T. M. Fisher (Environmental Activities Staff of GM), November 19, 1979.

20. *Supplemental Submission of American Motors Corporation Concerning Waiver of the 3.4 CO Emission Standard for the 151 CID 4-Cylinder Engine Family,* December 6, 1979.

21. **Federal Register,** Vol. 44, No. 233, December 3, 1979.

[FR Doc. 80–2731 Filed 1–30–80; 8:45 am]

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ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 86

[FRL 1397-8]

Revised Motor Vehicle Exhaust Emission Standards for Carbon Monoxide (CO) for 1981 Model Year Light-Duty Vehicles.

AGENCY: Environmental Protection Agency.

ACTION: Final Rule.

SUMMARY: This regulation establishes CO emission standards for 1981 model year light-duty vehicles belonging to certain engine families for which I have granted waivers from the standard otherwise applicable under section 202(b)(5) of the Clean Air Act, 42 U.S.C. § 7521(b)(5).

EFFECTIVE DATE: February 25, 1980.

FOR FURTHER INFORMATION CONTACT: Alex Varela, Manufacturers Operations Division (EN-340), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, D.C. 20460, (202) 472-9413.

PUBLIC DOCKET: Information relevant to this rule is contained in Public Docket EN-79-19 at the Central Docket Section of the Environmental Protection Agency (EPA), Room 2903B, 401 M Street, S.W., Washington, D.C. 20460 and is available for review between the hours of 8:00 a.m. and 4:00 p.m. As provided in 40 CFR Part 2, a reasonable fee may be charged for copying services.

SUPPLEMENTARY INFORMATION: Section 202(b)(1)(A) of the Clean Air Act ("the Act"), 42 U.S.C. 7521(b)(1)(A), requires that regulations applicable to CO emissions from light-duty vehicles or engines manufactured during or after the 1981 model year shall contain standards which require a reduction of at least 90 percent from CO emission levels allowable under the 1970 model year standards. Regulations implementing this requirement have established a CO standard, often referred to as the statutory standard for CO, of 3.4 grams per vehicle mile (gpm).

Section 202(b)(5) of the Act authorizes the Administrator, on application of any manufacturer, to waive the statutory CO standard for the 1981 and 1982 model years for any light-duty vehicle model regarding which the Administrator can make certain findings. In these cases, the Act requires that I promulgate substitute CO standards for 1981 and 1982 model year light-duty vehicles as discussed below. Applications for waivers considered here were submitted by American Motors Corporation (AMC), General Motors Corporation (GM), Toyota Motor Co. Ltd. (Toyota), and Lotus Cars, Ltd. (Lotus). The statutory criteria, my determinations regarding the criteria with respect to the vehicle models covered by the waiver applications, and my decisions to grant or deny the waiver applications appear in the consolidated decision published above. In that decision, I granted waivers covering the following vehicle models (engine families for purposes of that decision) for the 1981 model year only:

Manufacturer	Engine family
Lotus Cars, Ltd.	2.0L.
American Motors Corporation.	151 CID.
General Motors Corporation....	3.8L/231 CID-4V Turbocharged.

Once I have decided to grant waiver applications for these three 1981 model year vehicle models, the Act requires that I simultaneously promulgate regulations adopting emission standards not permitting CO emissions from 1981 model year vehicles of these Lotus, AMC, and GM, models to exceed 7.0 gpm. Moreover, that Act further requires that I promulgate regulations establishing these standards no later than 60 days after I receive the waiver application in question. The public has received an opportunity to comment on the waiver applications at issue, and I have considered those comments in making the consolidated decision which requires the promulgation of this rule. For these reasons, I find that providing notice and an opportunity to comment on this rulemaking before final promulgation is impracticable and unnecessary.

Note.—The Environmental Protection Agency has determined that this document does not contain a major proposal requiring preparation of an economic impact analysis under Executive Orders 11821 and 11944 and OMB Circular A-107.

In addition, because the decision accompanying this rulemaking already is based on a detailed analysis indicating that this rulemaking will have a negligible effect on air quality, the Environmental Protection Agency has not prepared an Environmental Impact Statement to accompany this rulemaking as well.

Dated: January 22, 1980.

Douglas M. Costle,

Administrator.

40 CFR Part 86 is amended as follows: Subpart A—General Provisions for Emission Regulations for 1977 and Later Model Year New Light-Duty Vehicles, 1977 and Later Model Year New Light-Duty Trucks and 1977 and Later Model Year New Heavy-Duty Engines.

40 CFR 86.081-8(a)(1), published at 44 FR 69416 (December 3, 1979), is revised to read as follows:

§ 86.081-8 Emissions standards for 1981 and later model year light-duty vehicles.

(a)(1) Exhaust emissions from 1981 and later model year light-duty vehicles shall not exceed the following levels for the following pollutants:

(i) Hydrocarbons—0.41 grams per vehicles mile;

(ii) Carbon monoxide—3.4 grams per vehicle mile, except that

(A) carbon monoxide emissions from light-duty vehicles of the following 1981 and 1982 model year engine families shall not exceed 7.0 grams per vehicle mile:

Manufacturer	Engine family
American Motors Corporation.	258 CID.
BL Cars, Ltd.	TR8, XJ12.
Chrysler Corporation	1.7 liter; 3.7 liter; 5.2 liter/4-V.
General Motors Corporation....	2.8 liter/173 CID-2V; 3.8 liter/231 CID-2V.
Toyota Motor Company, Ltd....	88.6 CID.

(B) Carbon monoxide emissions from light-duty vehicles of the following 1981 model year engine families shall not exceed 7.0 grams per vehicle mile:

Manufacturer	Engine family
Toyo Kogyo Company, Ltd.	91 CID, 120 CID.
General Motors Corporation....	3.8 liter/231 CID-4V Turbo.
American Motors Corporation.	151 CID.
Lotus Cars, Ltd.	2.0 liter.

(iii) Oxides of nitrogen—1.0 grams per vehicle mile, except that:

(A) oxides of nitrogen emissions from 1981 and 1982 model year light-duty vehicles manufactured by American Motors Corporation shall not exceed 2.0 grams per vehicle mile;

(B) oxides of nitrogen emissions from light-duty vehicles of the following 1981 and 1982 model year engine families shall not exceed the prescribed levels:

Manufacturer	Engine family	Model year	NO_x (gpm)
General Motors Corporation.	5.7 liter	1981, 1982	1.5
Daimler-Benz AG.	2.4 liter	1981	1.5
		1982	1.25
	3.0 liter naturally aspirated.	1981, 1982	1.5
	3.0 liter turbocharged	1981, 1982	1.5
AB Volvo	2.4 liter naturally aspirated.	1981, 1982	1.5

(Section 202 and 301(a) of the Clean Air Act, as amended, 42, U.S.C. 7521 and 7501(a)).

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